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Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities Under RCRA, Subtitle C, Section 3004. General Facility Standards for Location of Facilities (40 CFR 264.18)

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BACKGROUND DOCUMENT

STANDARDS APPLICABLE TO OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES UNDER RCRA, SUBTITLE C, SECTION 3004

General Facility Standards for Location of Facilities
(40 CFR 264.18)

This document (ms. 1941.32) provides background information and support for EPA's hazardous waste regulations

U.S. ENVIRONMENTAL PROTECTION AGENCY
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This document is one of a series providing support for regulations issued by the U.S. Environmental Protection Agency (EPA) under Subtitle C of the Resource Conservation and Recovery Act (RCRA). The regulations represent the initial effort for nationwide control of hazardous waste from point of generation, through transportation, treatment, and storage, to point of ultimate disposal.

This document covers standards applicable to hazardous waste management facilities, specifically to location of new facilities.

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I. INTRODUCTION

On December 18, 1978 EPA proposed a comprehensive set of regulations covering the management of hazardous wastes. This proposal included rules governing the location of hazardous waste management facilities (40 CFR 250.43-1, General Site Selection standards; 43 FR 59000).

In May, 1980, the Agency promulgated standards governing the management of hazardous wastes by existing facilities during the interim status period (45 FR 33154 et seq.) For any given facility, the interim status period extends from the effective date of the regulations (November 19, 1980 for most provisions) until the receipt (or denial) of a permit. Other than for direct surveillance and enforcement, there is to be little direct interaction between the Agency and the regulated community; i.e., the Agency will not be regularly reviewing designs, plans, operating methods, or technical information concerning the facility. Evaluating the adequacy of a facility is, properly, the subject of the permitting process.

The May, 1980 interim status standards do not include regulations for general site selection. Existing facilities, which are the only ones eligible for interim status, have already been sited and are usually in operation. For a given facility, any decision that it is not satisfactorily located can have major repercussions, not only for the faciliy but for the management of wastes in the area as a whole. Such decisions require careful study of the technical facts and the opportunity for the owner or operator and for the general public to present their views and to defend their positions. Such reviews and due process procedures are part of the permitting process and cannot be readily accommodated during the interim status period.

This document provides background information and support for the general Location standards around which permits will be granted. It explains how the regulations have come to be written as promulgated.

This document is organized into six sections. Following this introduction the Agency presents (Section II) the reasons why the regulation of site selection is important and necessary. Section II also explores State and other regulatory precedents and identifies some of the external sources of expertise who assisted the Agency. Next, in Section III, the Agency summarizes the December, 1978 proposed regulations, the rationale for them, and public comments received on them. These comments are then analyzed and a rationale for the substance of each final requirement is presented. Section IV analyzes and responds to comments on related issues including whether and to what extent location requirements should be different for new or existing facilities. Complete final regulation language can be found in Section V. Section VI contains the list of references.

II. RATIONALE FOR REGULATION

This section contains the reasons why the location of hazardous waste management facilities is important and why the Agency has chosen to develop regulations covering site selection. Also, in this section, the Agency explores how states and other Federal agencies have regulated the location of facilities and how these regulations and legislation have served as a precedent for the RCRA requirements. This section also identifies non-government experts who have assisted agency staff in exploring issues and developing these final requirements.

A. RCRA Authority and Mandate

In Section 3004 of Subtitle C of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) of 1976, (42 U.S.C. §§6901 *et seq.*), the Congress of the United States requires the Administrator of the U.S. Environmental Protection Agency (EPA) to promulgate regulations to establish such standards, for hazardous waste treatment, storage, and disposal facilities "as may be necessary to protect human health and the environment".

EPA is to promulgate regulations specifying standards, which *inter alia* include requirements for -

> "the *location*, design, and construction of such hazardous waste treatment, disposal, or storage facilities;" [emphasis added].

The Agency considers this language to be a specific mandate for these regulations.

B. Damage Incidents

Instances of past damages to human health and the environment are sometimes used as justification for standards which are designed to prevent the future occurance of such damages. It was difficult to find examples of damages that were solely caused by the presence of a facility at a particular location; usually careless waste management practices were the primary cause of trouble, though poor location often contributed to the extent of damages. In addition to damage incidents, EPA used its best professional judgment to predict potential damages that could occur due to locating in various environmentally sensitive areas. Many of the potential damages are obvious, or they can be deduced from past damages to similar structures. For example, tank and lagoon dikes can be ruptured by seismic activity. It is thus not wise to locate such facilities near known faults.

Structural damages resulting from recent earthquakes have been extensively documented. A three volume report on the San Fernando, California earthquake of February 9, 1971 includes a detailed discussion of the damages to building structures, utilities, transportation systems, and storage tanks. The San Fernando earthquake is considered "moderate" as it was assigned a rating of 6.6 on the Richter magnitude scale. (The great San Francisco earthquake of 1906 has been assigned a Richter magnitude of 8.3.)

Volume II of this report contains a detailed description of the effects of the earthquake on steel and concrete storage tanks.[1] Because tanks are employed for treatment and storage of hazardous waste, a discussion of damages to these units is included here. Although the tanks reported on were used to store water, it is reasonable to assume that similar damages would occur to tanks containing hazardous waste.

Common tank failures included buckling of the walls of steel tanks, collapse of tank roofs, and separation of connecting valves and fittings from tanks. Other damages to steel tanks included failure of riveted connections, displacement of tanks from their foundations, floor deformation, dislodging of an internal overflow pipe, failure of the weld between the shell and floor plate, sloshing of water, and rocking of tanks. The weld failure between the shell and the floor plate allowed water to empty from the tank which eroded several cubic yards of earth from under, and adjacent to, the tank. The concrete foundation of one tank broke in two because of the rocking of the filled tank and the differential earth movement under the tank. One cylindrical tank of reinforced concrete suffered cracking of the walls, and water leaked from most of the cracks.

There are however, several documented incidents involving flooding of hazardous waste management facilities. Summaries of these incidents can be found on pages 96, 97, and 98 of this document. These incidents illustrate the need for either locating outside of floodplains or designing facilities to withstand flood waters.

C. State Legislation and Regulation

EPA reviewed the solid and hazardous waste management legislation, regulations, and guidelines of several States to ascertain the various approaches that were used by the States to regulate the location of solid and hazardous waste facilities and to determine what elements the States deemed important to consider when siting hazardous and solid waste facilities.

1. Seismic Considerations

The Texas Technical Guideline on Site Selection and Evaluation (No. 2)[2] suggests factors that should be taken into consideration when selecting the location of an industrial solid waste disposal facility. Active faults and high seismic risk zones are two factors included for consideration.

Minnesota[3] includes a provision in its hazardous waste facility location regulations which states that,

> "No person shall establish, construct, or operate a hazardous waste facility in a location where the topography, geology, hydrology, or soil is unsuitable for the protection of the groundwater and surface water." [emphasis added]

California regulations for land disposal[4] at Class I disposal sites* prohibit siting over zones of active faulting (i.e., where evidence indicates that there may be movement in the disposal area along a fault trace during the active life of the site, which may be infinite in the case of some conservative toxic materials) or where other forms of geologic change (e.g., liquefaction due to seismic shocks, landslide, and subsidence) would impair the competence of natural features or artificial barriers which prevent continuity with usable waters.

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* Class I disposal sites may receive all waste groups. They must provide complete protection to ground and surface waters for all time so as to prevent hazard to public health and wildlife resources.

2. Endangered and threatened species and their critical habitats

In selecting a disposal site that will pose the least amount of threat to the environment, the Texas Guidelines[5] suggest that areas be chosen with a low fauna and flora diversity. Also included are suggestions to avoid wildlife refuges, migration routes, and areas of unique plant and/or animal communities.

In New York State,[6] related legislation illustrates that effects on endangered and threatened species and their habitats are considered important in determining significant effects on the environment. The (New York) State Environmental Quality Review Act (SEQR) requires that all state, regional, and local government agencies determine whether actions that they directly undertake, fund, or approve might have a significant effect on the environment. Specifically, one group of criteria are:

> "the removal or destruction of large quantities of vegetation or fauna; the substantial interference with the movement of any resident or migratory fish or wildlife species; impacts on a threatened species of animal or plant or the habitat of such a species;" (§617.11).

3. Floodplains

When selecting a disposal site, the Texas Guidelines[7] suggest that floodplains and fluvial terrace deposits be avoided.

Minnesota[8] prohibits hazardous waste facilities from locating in floodplains.

The Pennsylvania Solid Waste Rules and Regulations[9] prohibit sanitary landfills (§75.24), composting facilities (§75.34), and Class III* construction and demolition waste disposal sites (§75.33) from locating in areas subject to flooding once in every 100 years (i.e., in the 100-year floodplain).

The following regulations are less stringent in that they allow location in a flood zone provided that certain measures have been taken to prevent inundation of the facility.

For Class II** construction and demolition waste disposal, Pennsylvania allows location in areas inundated more frequently than once every 100 years if the site is approved by the Department of Environmental Resources. Criteria for approval are: "types and volumes of wastes, methods of emplacement, flood protection, erosion control, and compatibility with land and water uses." (§75.33)

The Iowa Solid Waste Disposal Commission[10] requires proposed sanitary landfills to submit a "plan" detailing various aspects of the facility's operation and expected impact. A landfill is granted a permit only if its plan is approved by the Commission. A portion of the report that must be submitted as part of the plan requires verification that the site is outside a floodplain or shoreland unless proper engineering and sealing of the site will render it acceptable, and that prior approval of the Iowa Natural Resources Council and, where necessary, the U.S. Army Corps of Engineers has been obtained.

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* Class III - waste materials resulting from the construction or demolition of buildings and other structures which may include, but are not limited to, wood, plaster, metals, asphaltic substances, and Class I and Class II wastes. (§75.33(b))

** Class II - waste materials resulting from land clearing, grubbing, and excavations which may include trees, brush, stumps, vegetative material, and Class I wastes. (§75.33(b))

New York[11] prescribes that secure (solid waste) land burial facilities must be located at least five feet above a floodplain unless provisions have been made to prevent the encroachment of flood waters.

Oklahoma Industrial Waste Management Rules and Regulations[12] state that, "No [industrial waste] disposal site or processing facility located at an elevation of less than two (2) feet above a one-hundred-year flood elevation shall be granted a permit, unless in the Department's [Department of Health] judgment adequate flood control measures have been provided in the site or facility design and construction. Flood control measures shall include protection against flooding to at least two (2) feet above the one-hundred-year flood elevation." (§3.5)

D. Related Federal Legislation and Regulation

1. Wetlands

To determine if the Section 404 and Section 402 programs under the CWA adequately preserved and protected wetlands, EPA reviewed regulations promulgated under those sections of the CWA. In a statement of its General Regulatory Policies (33 CFR 320), the U.S. Army Corps of Engineers lists functions of wetlands that they consider important. It is stated that each activity requiring a permit will be evaluated to determine whether it is primarily dependent on being located in, or in close proximity to, the aquatic environment and whether feasible alternative sites are available. The Corps also states that each wetland site will be evaluated with the recognition that it is part of a complete and interrelated wetland area.[13]

The EPA Final Guidelines for the Specification of Disposal Sites for Dredged or Fill Material are also part of the 404 program. These Guidelines are used to evaluate proposed sites for the disposal of dredged or fill material. They contain thorough procedures for evaluating impacts of a discharge on human health or welfare, and the effects on municipal water supplies, plankton, fish, shellfish, wildlife, and adjacent aquatic ecosystems. Great detail is also devoted to evaluating the effects of the discharge on the chemical and physical aspects of the wetland.

The NPDES (Section 402) permit program, administered by EPA, sets effluent limitations for point source discharges to waters of the United States. The effluent limitations are set in order to protect public water supplies, populations of fish, shellfish, and wildlife, and to permit recreational use of the water. The Agency believes that this program adequately protects human health and the environment with respect to point source discharges to wetlands.

2. Floodplains

The Federal Insurance Administration (FIA) of the Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP), which makes flood insurance available (in participating communities) to property owners at a reasonable cost, in return for which communities are required to carry out floodplain management measures to protect lives and reduce property loss.[14] This program has resulted in a National effort to map floodplains and regulate floodplain development.

EPA reviewed FIA's minimum requirements for communities participating in the NFIP.[15] EPA could thereby determine the scope and degree of restriction which is applied to structures located in floodplains in communities participating in the NFIP.

3. Seismic considerations

EPA reviewed the seismic activity controls that the Nuclear Regulatory Commission (NRC) uses in siting nuclear power plants and the Corps of Engineers uses in designing dams.[16] Particularly helpful were two reports prepared by the NRC:

(1) U.S. NRC - Information Report. Identification of Issues Pertaining to Seismic and Geologic Siting Regulation, Policy, and Practice for Nuclear Power Plants. April 27, 1979. SECY-79-300.

(2) U.S. NRC. Comparison of U.S. Federal Agencies Seismic, Geologic and Geotechnical Siting Regulations and Guidelines for Critical Structures. Presented at GSA Symposium: Geological Information - Problems in Transfer from Scientist to Policy Maker, Toronto, Canada; October 26, 1978.

These publications allowed EPA to gain insight into how other agencies regulate for faulting and vibratory ground motion and the advantages and disadvantages of their approaches.

EPA also reviewed a preliminary draft of 10 CFR Part 61, Disposal of Low-level Radioactive Waste and Low-activity Bulk Solid Waste prepared by the NRC. The criteria for determining site suitability (§61.96), state that a disposal facility is not allowed to be located in an area having a peak horizontal ground acceleration of greater than 0.25g with a recurrence interval of less than 500 years (note: a 500-year recurrence interval is equivalent to a 90% probability that the ground acceleration will not be exceeded in 50 years).

E. Contacts with other Federal Agencies and Professionals

In developing the final regulations, the Agency used a number of sources in addition to the very valuable information received by comment on the December, 1978 proposed regulations. There are, of course, a number of very excellent reports, studies, and other documents on such subjects as flooding and seismic activity and means of safeguarding structures against them. A list of those used extensively can be found in the References and list of Technical Documents (Section VI). In addition, EPA used the expertise of some specialists (e.g., hydrologists, professional engineers, and geotechnical engineers). Specifically, the Federal Insurance Administration of the Federal Emergency Management Agency provided EPA with information on how flood insurance maps are prepared and the availability of flood insurance maps, and answered technical questions for us. Memoranda of those meetings are in the Administrative Record for the Location standards. (See references 67 and 71.)

In addition, a private consultant (Mr. Charles L. Taylor) assisted EPA in developing the basis for the final standard on seismically active areas. Mr. Taylor is both a registered geologist and engineering geologist in the states of California and Oregon. Working with Woodward-Clyde Consultants in San Francisco, California, he has gained extensive experience in conducting, supervising, and managing geotechnical investigations for a wide variety of projects. He has been involved in developing criteria and procedures to identify, evaluate, and classify fault activity, and is especially experienced in the subject of ground deformation adjacent to active fault traces. He is presently involved in developing and evaluating criteria for nuclear waste management. Mr. Taylor also serves a number of public agencies in Northern California.

Before Mr. Taylor was enlisted to assist EPA with seismic considerations, Agency staff periodically consulted scientists at the U.S. Geological Survey in Denver, Colorado and the U.S. NRC in Bethesda, Maryland.

III. RESPONSES TO COMMENTS ON THE PROPOSED REGULATIONS AND RATIONALE FOR THE FINAL REGULATIONS

In December of 1978 (43 FR 59000) EPA proposed standards for the location of facilities in active fault zones, regulatory floodways, coastal high hazard areas, 500-year floodplains, wetlands, critical habitats of endangered and threatened species, recharge zones of sole source aquifers, and, for the location of active portions of facilities with respect to the facility's property line. The Agency received extensive comments on these proposed standards. In this Section, the Agency presents the results of analysis of these comments and supports the decisions made regarding the content of the final requirements. This is done on a regulation-by-regulation basis in the sequence they appeared in the proposal.

Each proposed requirement is first summarized and the rationale for it at the time of proposal is presented. Then the comments received are summarized and analyzed, and finally the rationale is presented in support of the final regulation and the decisions made concerning it. In the comment analysis section, paragraphs labeled "C:" summarize the comment, while those labeled "R:" contain the Agency's response.

A. Active Fault Zone

1. Summary of proposed standard (§250.43-1(a))

The proposed standard prohibited all hazardous waste facilities from locating in an active fault zone. "Active fault zone" was defined in proposed §250.41(b)(2) as,

> "a land area which, according to the weight of geologic evidence, has a reasonable probability of being affected by movement along a fault to

> the extent that a hazardous waste facility would be damaged and thereby pose a threat to human health and the environment."

2. Rationale for the proposed standard

Movement of land areas adjacent to an active fault clearly poses a threat to the integrity of structures, which may lead to uncontrolled release of hazardous waste, therefore constituting a danger to human health and the environment. The Agency believed that there were no existing, practicable engineering methods for design of a facility to assure structural integrity during a serious earthquake. Therefore, EPA proposed that no facility be allowed to locate in active fault zones.

3. Response to comments

a. The definition of active fault zone and the area affected by the standard.

Comment: The definition of an active fault zone is imprecise, thus making it difficult for owners or operators to determine whether their facilities are located in active fault zones. Without a more precise definition, or additional guidance, many widely different interpretations of the standard are possible.

Response: EPA agrees that the proposed definition was imprecise and that because of this, the exact area affected by the standard would be difficult to determine. In the standard which EPA intends to finalize the area affected by the standard is precise: the area within 200 feet of a Holocene fault.*

C: The definition is so encompassing that it would include large areas of the western United States.

R: Areas within 200 feet of a Holocene fault will include a very small percentage of available land in the western United States.[17]

C: Magnitude and frequency should be specified in the definition of active fault zone.

R: Magnitude is important in assessing ground motion and displacement along a fault. When EPA proposes a standard which addresses ground motion, magnitude will be considered. EPA has made the judgment that all new facilities must be 200 feet from any Holocene fault in order to protect against damage due to displacement and deformation. Frequency of recurrent activity has been considered by using the Holocene epoch as a basis for evaluating fault activity. It is expected that younger faults have a shorter recurrence interval of displacement.[18]

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* For the sake of brevity, in this document the term "Holocene fault" will be used to mean a fault which has had displacement in Holocene time.

C: The definition does not conform to the general interpretation of active fault zone which is, a fault along which there is evidence of movement or seismic activity during the past 10,000 to 20,000 years.

R: One of the reasons that EPA chose not to use the term active fault (zone) in the final standard is because a survey of past geologic literature shows that active fault (zone) has been defined in many different ways. Generally, it was defined using geologic information available at the time, or a definition was tailored to the purpose of a particular project.[19]

EPA believes that using a criterion of displacement within an identifiable period of geologic time will eliminate the confusion associated with using a term with many recognized meanings.

However, the time frame suggested by the commenter is largely in conformance with the Holocene epoch which represents about the last 11,000 years, although in some parts of the United States the limits of the Holocene may range from 10,000 to 15,000 years ago.

C: The definition should only cover areas having the potential for Richter Scale 7.0 or greater earthquakes (the commenter provided no information as to why this particular magnitude was selected).

R: The final standard will be directed towards the potential for surface faulting and not earthquake ground motion. The basis for using Richter magnitude 7.0 and greater earthquakes to identify significant faults (or fault zones) does not seem reasonable for a ground faulting standard since small magnitude earthquakes can cause damage to structures located near the epicenters.

C: The definition should only cover areas that have been active during the last 11,000 years so that it will conform with the California Geologic Hazards Act's definition.

R: The final standard is based on faults which have had displacement during Holocene time. EPA realizes that this is consistent with the California Geologic Hazards Act's definition. This consistency will help in implementing the standard as maps will be available for Holocene faults in California.

C: An active fault zone should be qualitatively defined; for example, the United States Geological Survey (USGS) has defined zones for determining degree of seismic activity. Facilities in the USGS's Zone 3 (the most active zone) should be screened; however, do not exclude all hazardous waste sites from this zone.

R: EPA believes that reliance on a qualitative system is unnecessary because the actual location of faults would certainly be a variable in the screening process. Thus, the end result would be the same as that under the seismic standard where the permit applicant is required to determine if there are any Holocene faults near the facility (specifically, within 200 feet of portions of the facility where treatment, storage, or disposal will be conducted). However, the USGS's seismic risk map can be used as a general indicator of the location of faulting activity because it is based on historic seismic activity which correlates strongly with displacements along Holocene faults.

b. Design and construction of facility to mitigate seismic considerations

C: Facilities should be allowed to be located in active fault zones if the facility is designed and constructed:

- to withstand the expected seismic activity of the area; in particular, the fault zone slippage effects on a facility.
- with a certain prescribed safety factor tailored to the seismic activity of the area.
- so that hazardous waste is not likely to escape and cause substantial hazard. (This should be determined using a case-by-case analysis.)

R: At this time it is impracticable from economic, engineering, and architectural points of view to design a critical structure to withstand serious damage under the stress of surface fault rupture.[20] EPA has therefore prohibited facilities from locating within 200 feet of a Holocene fault because the damaging effects of major fault displacement and deformation associated with historical surface faulting ha~~s~~ve occurred within this width.

EPA has learned that it is not appropriate to use safety factors for designing structures to withstand certain degrees of ground motion. The concept of using safety factors is becoming obsolete because is it difficult to achieve agreement on what is an appropriate safety factor.[21]

EPA has determined from available information that significant gaps in the knowledge of how hazardous waste facilities would be affected by different ground motion parameters (e.g., acceleration, velocity, significant duration) exist at this time. The state-of-the-practice is advanced enough and acceptable procedures are available to design and construct civil engineering structures to withstand earthquake shaking. Although it is assumed that these procedures may be modified so that they can be applied to units used to manage hazardous waste, there are no commonly accepted "standards" for design and construction of such units.

EPA is not in agreement with the commenter that suggested a design and construction performance standard. EPA believes that ground motion, and displacement and deformation should be considered separately because of their inherent differences.

c. Restricting facilities in active fault zones should be based on:

C: - the "degree of hazard" of the waste being treated, stored, or disposed at the facility.

- the particular treatment, storage and disposal method used by a facility.
- the probability that a certain magnitude of earthquake will occur.

R: EPA has not developed a comprehensive Degree of Hazard system. For a discussion of this issue, see the Degree of Hazard Background Document that accompanied the Phase I rules.

With regard to ground motion, EPA cannot determine how to restrict facilities based on the particular waste management methods used at the facility because the differential effects of different ground motion parameters on the components (e.g., landfills, tanks, incinerators, etc.) of a facility are not known.

With regard to displacement and deformation, EPA has set a distance of 200 feet from a Holocene fault as the set-back distance for all new facilities. It seems plausible to EPA however, that some facilities may be able to locate at some distance within 200 feet from a Holocene fault and not pose a threat to human health and the environment in the event of fault displacement. In the preamble to these rules, EPA requests comment on what may be appropriate set-back distances from Holocene faults for facilities which contain different operational units and, if variable set-back distances would be justified on the basis of the nature and quantity of waste managed at the facility. EPA also requests that commenters specify their reasoning and justify distances which are suggested with technical data to the degree possible.

Probabilities of certain magnitudes of earthquakes are not available for most regions in the U.S. where earthquakes commonly occur. Beyond this problem, it would not be appropriate for EPA to specify a certain magnitude of earthquake because the damage caused by a certain magnitude of earthquake is dependent upon the structures at a facility and the local geologic conditions.

d. Miscellaneous comments.

C: The hazard posed by locating a facility in an active fault zone may be less than the hazard posed to the population along transportation routes from generation sites in active fault zones to facilities located in "non-active fault zones".

R: The seismic standard should not result in the transportation of wastes over long distances. Transportation distance may increase by a few miles; however, EPA believes that minor increases in transportation are justified due to the hazards associated with locating within 200 feet of a Holocene fault. The rule does not affect existing facilities.

C: Additional flexibility needs to be provided so that facilities will be allowed to locate in areas that are protected by structures outside the facility and not built or controlled by the operator.

R: EPA knows of no structures that can be located outside a facility that would render a facility earthquake resistant. Engineering methods to make a facility earthquake resistant are tied to the direct design, construction, and operation of the structural components of a facility.

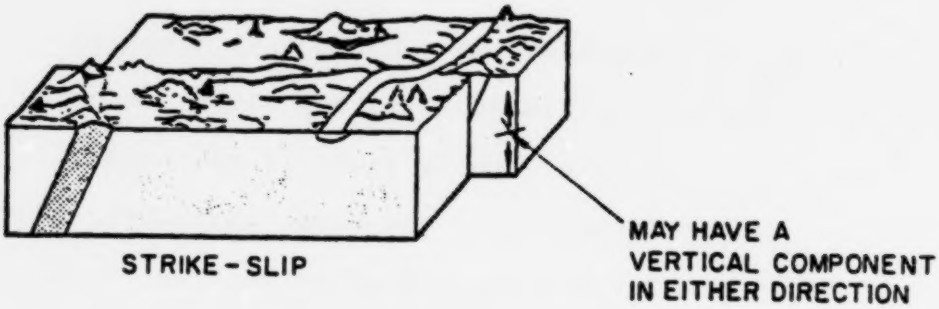
4. Rationale for the final regulation (§264.18(a))

It cannot yet be claimed that there is only one cause of all earthquakes. A minor cause of earthquakes is volcanic activity. Some deeper earthquakes may perhaps be related to sudden changes in rock properties due to motion deep within the Earth's mantle. However, most destructive, shallow-focus earthquakes appear to be associated with a sudden rupturing (faulting) of the Earth's crust. (The crust is a rock layer of varying thickness, ranging from 30 miles under continents to 3 miles under oceans, which is found world-wide and is composed of mainly basaltic and granitic rocks.) The resulting earthquakes are caused by the sudden releases of accumulative strain energy. The rupture, or break, is called a fault and is generally accompanied by displacement of blocks either vertically or horizontally or both, on opposite sides of the fracture.[22]

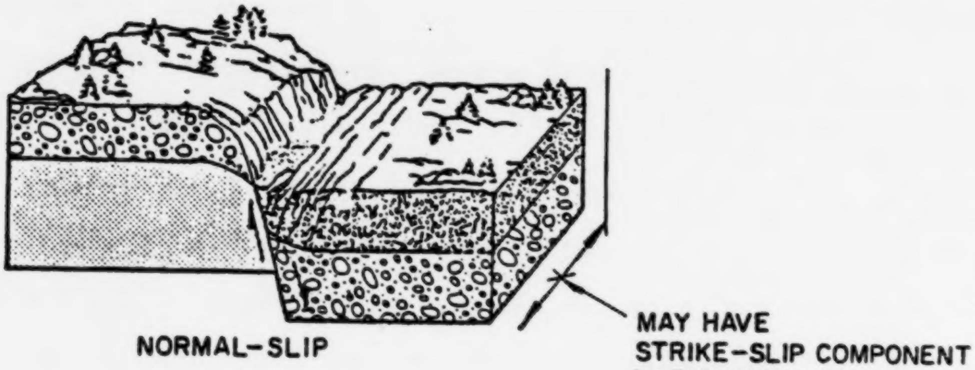
Hazardous waste management facilities will be located in areas of the United States which have been the sources of historical earthquakes and which are expected to be the sources of earthquakes in the future.[23,24] Since some of these historical earthquakes resulted in damage to existing structues there is also the potential for damage to hazardouos waste facilities. The damage may or may not be of consequence to the performance of the facility. Historical damage to structures has been associated with displacement and deformation along faults, strong ground motion (shaking), and ground (or soil) failure. Therefore, in locating hazardous waste management facilities in areas which have been subject to historical earthquakes, consideration should be given to the potential for surface faulting, ground motion, and ground failure.

a. Fault Displacement and Associated Deformation

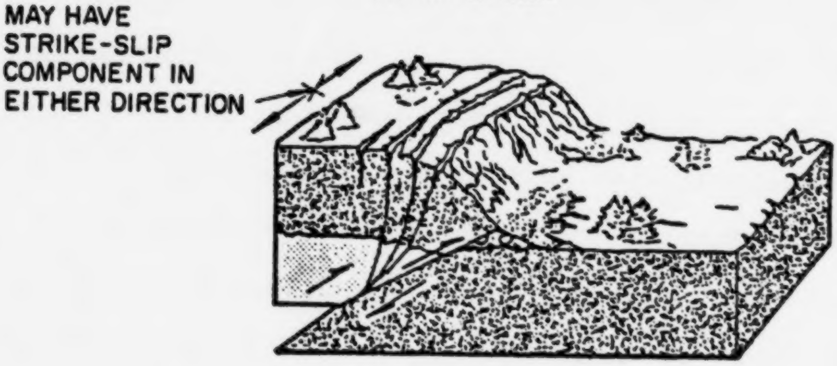
Faults are fractures along which rocks on one side have been displaced with respect to those on the other side. Displacement is the relative movement of any two sides of a fault measured in any direction. The displacement may be confined to the subsurface or it may continue to the Earth's surface. Geologists refer to the intersection of a fault and the earth's surface as a fault trace. Displacements along a fault can be horizontal, vertical, or a combination of both and can be on the order of a few inches or feet to as much as 20 feet or more.[25] The width of an individual fault trace is generally on the order of several feet to several tens of feet.[26] There are three main types of faults and each is characterized by a distinctive type of movement and geometry. (Figure 1) Strike-slip fault displacement is essentially a horizontal lateral motion along a nearly vertical fault plane. Structures placed across or in the vicinity of a strike-slip fault can be subject to shortening (compression), lengthening (extension), and distortion (deformation) as well as displacement. Normal-slip fault displacement is primarily a vertical (down drop) separation with one side of the fault down in relation to the other side. Structures located across a normal-slip fault are generally


MAY HAVE A
VERTICAL COMPONENT
IN EITHER DIRECTION

STRIKE-SLIP


MAY HAVE
STRIKE-SLIP COMPONENT
IN EITHER DIRECTION

NORMAL-SLIP


MAY HAVE
STRIKE-SLIP
COMPONENT IN
EITHER DIRECTION

REVERSE-SLIP

FIGURE 1

THREE TYPES OF FAULT DISPLACEMENT 27

subjected to a horizontal lengthening across and down the scarp (steep slope) produced by the faulting. A reverse-slip fault is essentially a vertical thrusting of the upper block over the lower block. Structures located across reverse-slip faults are generally subject to shortening (compression) across the fault scarp. Displacement of normal-slip and reverse-slip faults also subjects structures that are near the fault trace to distortion.[27]

Seismically active areas usually do not contain only one fault, but a number of faults grouped together. These faults are grouped within a well defined width or zone. Such a grouping is commonly referred to as a "fault zone" since it consists of a zone (a width) with several individual faults.

M.G. Bonilla studied historic instances of surface faulting in the continental United States and adjacent parts of Mexico. His study has provided the most comprehensive data on the spatial relationship of faults. The following classification system is based on his work.[28]

The general fault zone usually can be divided into a main fault zone, a branch fault zone, and a secondary fault zone (Figure 2). The spatial relationship of individual faults in the fault zone has resulted in this classification system. The main fault zone contains the main fault (i.e., the fault with the greatest displacement, length, and continuity) and closely associated faults. The width of the main zone of faulting has been reported to range up to 3,000 feet, but in most of the cases (71%) (reported by Bonilla, 1967) the width was less than 1,600 feet and for half (50%) the width was less than 550 feet. (Figure 3) Occasionally, faults diverge from and extend well beyond the main zone of faults and are referred to as branch faults. Secondary faults are completely separate spatially from the main fault and sometimes form several hundred feet to a few miles from the main fault. Associated with main, branch, or secondary faults are often small, subsurface faults evident as fault planes in a geologic investigation. These planes run parallel to the fault and typically are considered a part of that fault.

Adjacent to the fault rupture is commonly found a zone of deformation. This is an area where the ground has been bent or warped as a consequence of the two surface planes moving relative to one another. Surface deformation is frequently reported within a zone of several tens to several hundred feet wide.[30,31] Structures located within this zone are subject to distortion and are likely to be subject to damage.

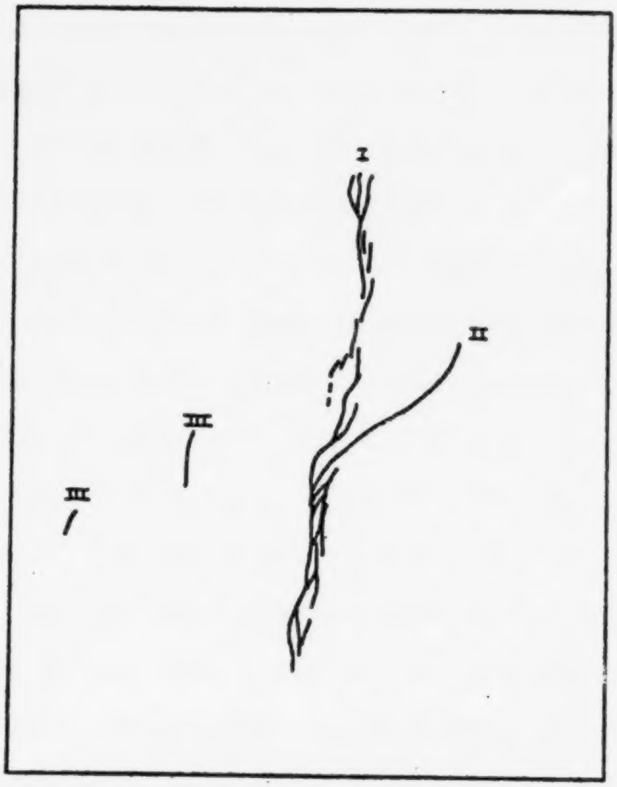


Figure 2. Zones of fault rupture.29
(I) main fault zone; (II) branch fault;
and (III) secondary faults.

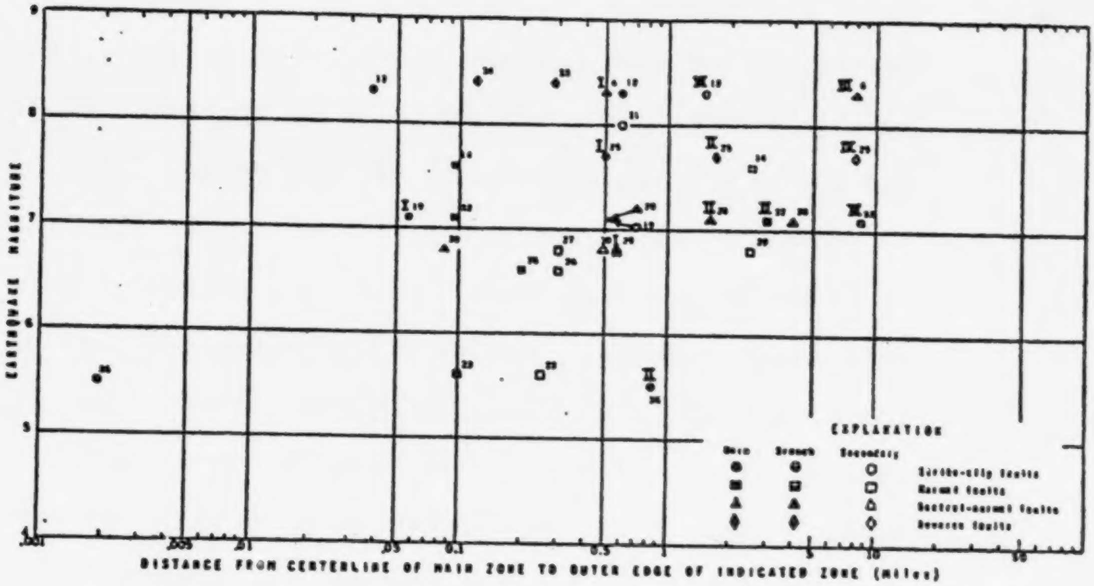


Figure 3. Distance to outer edge of zone as related to earthquake magnitude. 32

Roman numerals indicate, for each of the four types of faults, the greatest distance to the outer edge of the main zone (I), the zone of branch faults (II), and the zone of secondary faults (III).

Structures located across a fault at the time of surface faulting will be subjected to fault displacement. The amount of and direction of displacement and deformation will depend upon the type of fault (strike-slip, normal-slip, or reverse-slip), the amount of displacement (a few inches or feet to as much as 20 feet), the attitude of the fault plane, and the surficial geology.[33] At the present time it is generally not practicable to design most structures to withstand serious damage under the stress of surface fault rupture. Mitigating measures are available for lifelines (pipelines, electrical lines, roads, canals, etc.) and earthen structures (dams, embankments, fills, etc.) which must cross a fault subject to displacement. The best protection, however, for hazardous waste facilities is to avoid faults subject to displacement. Consequently, the regulation which EPA intends to finalize prohibits location of portions of a facility where treatment, storage, or disposal of hazardous waste will be conducted within a distance (200 feet) of the fault. This distance typically covers the zone of deformation.

The purpose of the seismic regulation at §264.18(a) is to protect facilities from the damage which may occur due to displacement of a fault and the associated deformation. In this regulation EPA intends for fault to be a generic term which includes fault traces, fault planes, faults which do not have surface expression, main faults, branch faults, and secondary faults.

EPA reviewed seismic criteria for the State of California when determining an exclusion width for hazardous waste management facilities. The Alquist-Priolo Special Studies Zones Act of 1972 regulates development in California near Holocene faults. In accordance with the Special Studies Zones Act, the California State Mining and Geology Board has established that: (1) no structure for human occupancy will be permitted to be placed across a Holocene fault trace; and (2) no structures will be permitted within 50 feet of a Holocene fault unless an appropriate geological investigation demonstrates an absence of (Holocene) branches of that fault. The latter standard is intended to represent minimum criteria only, for all structures. The Mining and Geology Board recommends that certain essential (e.g., schools and hospitals) or critical structures* should be subject to more restrictive criteria at the discretion of cities and counties in California.[35]

California's rules for siting liquefied natural gas facilities prohibit liquefied natural gas tanks from being sited within 100 feet of a capable fault.[36]

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* Examples of critical structures are dams, reservoirs, nuclear reactors, tall buildings, schools, prisons, and structures containing large quantities of potentially explosive or toxic materials.[34]

Recency of Faulting - EPA does delimit the time period of last displacement of the fault; the seismic standard specifies faults which have had displacement in Holocene time. The Holocene is a geologic time period extending from approximately 11,000 years ago to the present. More specifically, it is the most recent epoch of the Quaternary period. Holocene deposits are those formed within this time period, during which climatic and sea level conditions, and geomorphic processes have been similar to or are ongoing with those now prevailing.

The presence of faulting can be established through physiographic features, and stratigraphic and structural relations within the Quaternary or Pre-Quaternary deposits. The recency of fault activity is more difficult to establish in Quaternary or older deposits. In this case, ongoing or Holocene processes superimposed upon the Quaternary and older deposits must be identified and evaluated in terms of fault related discontinuities. Such processes mainly include soil formation and profile development, and weathering, all processes in which some sort of layering is developed. In areas where layering is not obvious, age dating of materials at various depths can be carried out to establish time horizons.

Where the above methods of fault identification and activity assessment cannot be achieved, seismic records and historic methods may help to identify fault areas and to establish activity.[37]

While many areas of the United States have Holocene deposits and landforms of significant extent such that evaluation of fault presence and activity can be achieved, there are areas where Holocene deposits and landforms are not well developed, as in areas where glacial activity has stripped the surficial ground cover and left highly resistant rock such that inspection of Holocene deposits and landforms for fault related features is hindered, and the presence of potentially active or active faults and the recency of possible fault movements cannot with this means be adequately assessed. In situations of this sort, reference to seismic epicenter plots and historic records must be utilized, as well as identification and close examination of possible fault related features expressed in Pleistocene and older deposits.

Where deposits or landforms of known Holocene age are offset or displaced by faults, movement along the fault is established to have occurred within Holocene time. As major geologic processes such as faulting are long lived, lasting millions or tens of millions of years, movement along faults within the past 11,000 years can reasonably be considered to represent a high potential for future activity along a fault.[38] For example, faults of Holocene age, as a class, have a greater probability of future activity than faults classified as Quaternary age (last 2-3 million years).[39]

In the proposed rule, EPA used "active fault zone" to delimit faults of concern. "Active fault zone" was defined as, "a land area which, according to the weight of geologic evidence, has a reasonable probability of being affected by movement along a fault to the extent that a hazardous waste facility would be damaged and thereby pose a threat to human health and the environment."

EPA has decided not to use the terms "active fault" and "active fault zone" because of the various and sometimes conflicting definitions commonly in use and cited in publications.[40] Other disadvantages of using the proposed definition are that it is difficult to achieve agreement on the meaning of the phrases, "weight of geologic evidence" and "reasonable probability", and there is no set of criteria that can be used to demonstrate activity (or non activity) of a fault.

EPA decided to use Holocene faults as the group of faults which are significant to hazardous waste facilities based on the following criteria:

(1) The time period selected for defining the range of last fault movement should be

long enough to provide a level of acceptable risk,

(2) Faulting within the time period should be recognized by surface features or subsurface displacements,

(3) The time period can be related to a geological time with identifiable deposits or features which can be used to establish the time of last displacement (should the need arise).

Faults which have had displacement in Holocene time are the group of faults which are most widely used in current engineering practice[41,42] and for evaluating the hazard of surface fault rupture.[43] It should additionally be noted that the hazard of surface fault rupture is not only based on the recency of activity but also on the recurrence of faulting along existing faults. With respect to the latter basis, future faulting generally is expected to recur along pre-existing faults.[44]

The U.S. Army Corps of Engineers and the Nuclear Regulatory Commission both use capable fault (in general, movement within the last 35,000 years) to define the recency of fault activity that concerns them. The harm and damage which may result from the structural failure of a dam or nuclear reactor in the event of fault displacement is, in most cases, greater than that which would occur as a result of damage to a hazardous waste facility. The spread of radiation is difficult, if not impossible, to contain. Undoubtably there would be a great loss of life and property if a large dam were to fail in the vicinity of a large population center.

In summary, EPA uses the concept of "displacement along Holocene faults" because it:

- Identifies a specific geological time frame (within about the last 11,000 years).
- Represents a specific, unique, and recognizable group of geological deposits.
- Represents an area of investigation, research, and mapping by Federal and State agencies which will provide more specific data that can be used for siting.
- Is a concept which can be demonstrated and agreed on within the geological profession.

Existing Facilities - EPA intends to exclude existing facilities from the seismic standard on the basis of concern about the impact of possible facility closure on hazardous waste capacity, about the practicability of moving existing facilities, and, the relative infrequency of seismic activity. Since the Agency was unable to include provisions in the standard for designing facilities (unlike the 100-year floodplain standard where the facility can be designed to prevent washout) to withstand the effects of surface faulting, closure or moving would be the only alternatives for existing facilities. Moving or closing existing facilities may be impractical in some cases. For example, on-site storage and treatment facilities may be associated with existing manufacturing operations which must store or treat waste to at least some extent as an integral part of their operations. Movement or closure of these storage facilities might result in movement or closure of the manufacturing facility. Off-site storage facilities can be closed or moved, but this would impact existing hazardous waste capacity, possibly in areas where shortages already exist. Since storage typically is associated with other hazardous waste management facilities, such as incinerators, the impact would go beyond storage alone. Should this standard be applied to incinerators and land disposal facilities in the future (as is likely when further standards under Part 264 are promulgated for those facilities) the impact on capacity would be more direct. In the case of existing landfills, closing a facility (with the waste in place) would not significantly reduce the potential for damage associated with faulting. Finally, given the relative infrequency of seismic activity, the Agency believes that there is a very low potential for an earthquake occuring before most existing facilities close at the end of their normal lifetime.

Nevertheless, EPA is not fully convinced that the standard should not apply at least to existing storage facilities (or incinerators) and has requested comment on this issue in the preamble to these regulations. In particular, the Agency asked for comment on the number of existing facilities currently located in areas restricted by this standard, and the impact this restriction would have on those facilities and on capacity in the area where they are located. After reviewing this information the Agency will reconsider whether this standard should apply to existing facilities.

Demonstration of Compliance (Part 122) - The owner or operator of a facility must demonstrate compliance with the seismic standard as part of his permit application. For facilities that are located in areas of the United States which are not likely to be subject to seismic activity the demonstration will be a simple one. Appendix VI to Part 264 contains a list of the political jurisdictions in the United States in which owners or operators of new facilities must demonstrate that there are no Holocene faults within 200 feet of portions of the facility where treatment, storage, or disposal of hazardous waste will be conducted. (See Section V of this document.) If the political jurisdiction in which a facility is located is not listed in Appendix VI as needing to comply, the owner or operator has complied with the seismic standard.

The list in Appendix VI is taken from the Applied Technology Council's (ATC) map entitled, "Map For Coefficient A_a". (Figure 1-1, in Tentative Provisions for the Development of Seismic Regulations for Buildings.)[45] This map is based on the earlier work by Algermissen and Perkins (1976) which resulted in a contour map of the United States which estimated the maximum ground acceleration to be expected from earthquakes occuring in the U.S.[46] It was based primarily upon the historic seismic record and represents the best work done thus far on estimating the relative earthquake hazard in the United States as a whole. To a minor degree, data on the distribution of faults was used. The ATC modified this map by increasing the scale and inserting the boundaries of counties and other political jurisdictions. The ATC map shows seven zones of increasing ground acceleration. The political jurisdictions listed in Appendix VI are those which are likely to be subject to an estimated .10g of ground motion (specifically effective peak acceleration). Based on the work by Howard and others (1978) and a review of other available data it appears that the areas of the United States most likely to be influenced by earthquakes with associated surface faulting are within the .10g contour.[47] In addition, the regions in the Eastern United States which have experienced reasonably large damaging earthquakes in the past are outlined by the .10g contour (i.e., Charleston, S.C.; New Madrid, Mo.; New England).[48]

EPA has attempted to minimize the cost of compliance with the seismic standard in all cases, but particularly for facilities where the risk of seismic activity is very low.

Because a demonstration of compliance with the seismic standard is made as part of the permit application, Part 122, Subpart B, §122.25(a) contains procedures which must be followed to adequately demonstrate compliance with the standard. The permit applicant is provided with several alternative study approaches because site-specific conditions will vary considerably due to type of faults, geologic structure of the area, and the existence of published data. The information developed during the study must be of sufficient quality to be acceptable to geologists experienced in identifying and evaluating seismic activity.

Study approaches may include a review of published geological data, an aerial reconnaissance, an analysis of aerial photographs, a geological reconnaissance of the site, or trenching. EPA intends to require these studies to be carried out to different distances from the facility; specifically, 3000 feet and 5 miles. These distances are generally accepted within the geologic profession as distances which must be investigated to conclusively make the demonstrations required. These distances are also based on results of geological studies, the most imporant of these is by M.G. Bonilla (1967) which analyzes historic surface faulting in the continental United States and adjacent parts of Mexico. Bonilla has indicated that the maximum distance from the centerline of the main zone of surface faulting to the outer edge of that zone is on the order of 3,000 feet. Bonilla also found that some branch and secondary faults do appear within the zone.[49] Therefore, if an area within 3,000 feet of the site is studied and there is no evidence of Holocene faulting, EPA is confident that the facility is not located within a main fault zone where the large-scale damage due to displacement and deformation occurs.

The other study distance is five miles. Regional studies include a review of published geological data and an aerial reconnaissance to cover an area within a five mile radius of the site. Five miles is specified here because surface faulting data (Bonilla, 1967) indicate that the majority (81%) of branch and secondary faults associated with the main Holocene fault zone occur within five miles from the centerline of the main zone. This distance is also accepted as a regional study distance by the Nuclear Regulatory Commission (NRC) for siting nuclear power plants[50] and by the State of California Public Utilities Commission for siting of liquefied natural gas facilities.[51]

The NRC specifies that sites within about five miles of a surface capable fault greater than 1,000 feet in length are usually not suitable for a nuclear power station. In any case, extensive and detailed geologic and seismic field studies and analyses should be conducted for such a proposed site.

The level of effort which will be required to make the demonstration to comply with the standard will depend upon the amount of evidence which indicates that Holocene faulting is likely or unlikely. For example, if Holocene faults have been mapped within one mile of the facility the owner or operator may want to trench at the outset because, even though the other procedures are followed through, the data may indicate that trenching must be done to conclusively make the demonstration. On the other hand, if no published data indicate faulting within (for example) 5 to 10 miles of the site, an aerial reconnaissance may be all that is required to sufficiently demonstrate lack of faulting activity. A guidance/ permitting manual for the Location standards will be available shortly which will provide greater detail on the study procedures identified in Part 122.

Location of Holocene Faults - The United States Geological Survey (USGS) and some State geological agencies are identifying Holocene fault displacements in present mapping programs, and mapping of Holocene deposits is becoming more widespread. Both of these will be of benefit in locating acceptable waste facility sites. The recent map by Howard and others[52] - Preliminary map of young faults in the United States as a guide to possible fault activity - shows the parts of the U.S. where Holocene faults have been identified: the Western United States and the New Madrid area in the Midwest. At present, no Holocene faults have been identified on the East Coast.

The map by Howard and others provides some indication of where Holocene faults are likely to be found. Geological studies will be necessary to assess the location of any Holocene faults in the vicinity of a site. This is expected to require review of available literature published by the USGS and State geological agencies, with more site-specific studies in the Western United States and the New Madrid area. The growth faults along the Gulf Coast (i.e., see Howard and others), are not considered the source of earthquakes or likely to have large displacements (if any) and therefore, should not be considered in the context of seismicity.

The State of California has the greatest number of mapped Holocene faults. California's Alquist-Priolo Special Studies Zones Act of 1972 required, among other things, the mapping of traces of some of the major faults in California which have had displacement in Holocene time. The status of this mapping program is contained in the California Division of Mines and Geology's Special Publication 42 (Revised March 1980), entitled Fault - Rupture Hazard Zones in California by Earl W. Hart.

Techniques for identifying Holocene faults will be discussed in the guidance/permitting manual. Scientific reports also exist which identify criteria which can be used to recognize faults which may be of Holocene age. One good report is "State-of-the-Art for Assessing Earthquake Hazards in the United States" by David B. Slemmons (1977).[53]

b. Ground Motion

Seismic waves generated by an earthquake travel in every direction away from the source and are manifested in the vibrations of the material beneath a structure and the structure itself. Ground motion pertains to the energy released by the earthquake, expressed in terms of intensity and duration, as transmitted through the ground. Damage from strong ground motion (shaking) is caused by the transmission of earthquake vibrations from the ground into the structure. Ground motion is fundamentally different than displacement and deformation for damage in the former is only secondarily related to distance from the fault. Thus, the impact that ground motion has upon structures is a function of the energy characteristics of the ground located between the facility and the epicenter of the earthquake, and the design of the structure. A facility may be located adjacent to or hundreds of miles away from the displaced fault and still be damaged by the resulting ground motion.

There has been some attention given to the design of earthquake resistant structures. Perhaps the most significant efforts to date have been by the Nuclear Regulatory Commission,[54] and the study by the Applied Technology Council entitled "Tentative Provisions for the Development of Seismic Regulations for Buildings". However, few data exist that relate ground motion dynamics to adequacy of engineering design for various operational units at hazardous waste facilities. Thus, EPA is not presently prepared to set a ground motion standard until it can determine which components of ground motion (e.g., acceleration, velocity, significant duration) should be the subject of design for different operational units (e.g., tanks, surface impoundments, incinerators) at facilities. This requires an analysis of data on: (1) probability of occurrence of different magnitudes of earthquakes, (2) types of construction needed to protect against the different levels of ground motion, and (3) the feasibility and costs of such construction. Such an analysis is needed for each operational unit of a hazardous waste facility. In order to resolve these uncertainties, it is apparent that information from the fields of geology and engineering which could be utilized in designing hazardous waste facilities for seismic considerations must be gathered and analyzed by the engineering community.

EPA has decided that a ground motion consideration will not be included as part of the present seismic standard because of the lack of knowledge in the following four areas:

1. Which components of ground motion should be used for the full range of operational units at facilities.
2. The level of ground motion which is critical to the full range of operational units at facilities.
3. The designs which could be used to make a facility resistant to the pertinent component of and level of ground motion.
4. The costs of earthquake resistant designs.

EPA has invited the public to comment on these areas of concern in the preamble to the Location standards.

c. Ground Failure

Ground failure occurs when the energy characteristics of an earthquake cause a particular piece of ground to lose its qualities of support. This may occur in several different forms to include landsliding, liquefaction, settlement, and lurching. While the cause of damage due to ground failure originates with ground motion, actual damage to a facility results because of the failure of the ground in or near the facility. It is common for earthquake-triggered landslides to occur as renewed movements of deposits resulting from previous landslides. Areas subject to slope instability and strong earthquakes could be subject to earthquake-triggered landslides.

Liquefaction occurs when granular, essentially cohesionless soils undergo small to complete losses of shear strength due to the buildup of fluid pressures in the soil pore water caused by cyclic loading during earthquakes. When the loss in strength is low to moderate, partial liquefaction may cause ground settlement and associated ground cracking. However, when liquefaction is complete, the soil can behave as a fluid, and catastrophic failures, including soil flows and landslides, have occurred as a result. Partial liquefaction during strong ground shaking may occur in dense to very dense cohensionless soils, complete liquefaction typically occurs only in loose to medium dense cohesionless soils.

Seismic settlement is also typically associated with cohesionless soil deposits but can occur in poorly placed or uncompacted man-made fill. The strong ground shaking that occurs during earthquakes will densify loose granular soils. When these soils are above the groundwater table, their densification and resulting ground subsidence will occur rapidly. When located below the groundwater table, the pore water pressures that have developed during the shaking must begin to dissipate before a decrease in soil volume can occur and, as a result, settlement occurs at a rate commensurate with the flow of water from the cohesionless soil layer.

Lurching may be generally defined as the development of all types and sizes of irregular ground fractures, cracks and fissures associated with ground motion, settling, and the passage of surface wave phases during earthquakes. In this general sense, ground cracks that occur as a result of liquefaction, compaction, settlement, or landsliding may be termed lurch cracks. More specifically, lurching involves the seismically induced lateral movement and spreading of ground toward a free face, together with the development of associated tension cracks in the ground behind the free face.

There are simplified procedures for assessing the potential for liquefaction on the basis of boreholes drilled on the site and the level of ground acceleration expected at a given site. The density of the subsurface granular deposits and the ground acceleration value are necessary items.

The assessment of the potential for lurching and earthquake induced landslides are generally not subject to analytical procedures but are based on historic observations. They are commonly assessed on the basis of performance of similar materials during historical earthquakes.[55]

As in the case of ground motion, EPA does not have sufficient data relating ground failure risks to hazardous waste facility siting and design. Therefore, EPA does not at present include a ground failure standard; although the Agency plans to propose such a standard in the future. To assist EPA in this regard, the Agency has requested (in the preamble) data on the various issues relating to a ground failure standard to include:

(1) Is it necessary to distinguish between hazardous waste facility types when setting a standard?

(2) Should the standard involve a prohibition from locating facilities in areas of possible failure or should the standard allow location of facilities in such areas if properly designed?

(3) What types of ground and soil conditions are reasonably part of a standard?

(4) What types of tests would be definitive for demonstrating compliance?

5. Summary of the seismic regulation (§264.18(a))

Portions of new facilities where treatment, storage, or disposal of hazardous waste will be conducted must not be located within 61 meters (200 feet) of a fault which has had displacement in Holocene time.

"Fault" means a fracture along which rocks on one side have been displaced with respect to those on the other side.

"Displacement" means the relative movement of any two sides of a fault measured in any direction.

"Holocene" means the most recent epoch of the Quarternary period, extending from the end of the Pleistocene to the present.

B.. Regulatory Floodway

1. Summary of the proposed standard (§250.43-1(b)

The proposed standard prohibited hazardous waste facilities from locating in a regulatory floodway. "Regulatory floodway" was defined in proposed §250.41(b)(70) as,

> "the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than a designated height".

Regulatory floodways are selected by communities participating in the National Flood Insurance Program (NFIP)* within the limits imposed by FIA's minimum criteria. The proposed regulation required an owner or operator to obtain an analysis using FEMA-approved methods to determine whether the facility would be located within the regulatory floodway if such boundaries had in fact been mapped.

2. Rationale for the proposed standard

Regulatory floodways are typically those portions of the 100-year floodplain which are frequently flooded and which becomes areas of major flood dynamics during large floods. According to the Federal Insurance Administration of FEMA, in regulatory floodways "floodwaters exert their maximum pressures, erosion is greatly accelerated and loss potential is increased." (43 FR 6046, February 10, 1978) If flood flow is impeded by structures in this critical portion of the floodplain, flood heights will increase causing an increase in the area flooded. Hazardous waste facilities were therefore prohibited from locating in regulatory floodways because occupying this portion of the floodplain would result in greater flood damages to others as well as increasing the probability that hazardous waste would be released to the environment.

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* The NFIP is presently managed by the Federal Emergency Management Agency (FEMA) - Federal Insurance Administration (FIA).

3. Response to comments

a. The lack of a variance procedure.

C: Because the standard is unfairly rigorous, particularly for existing facilities, exceptions to the standard should be allowed. The following conditions for examption were suggested by the commenters:

i. existing facilities - if these facilities pose no threat to human health and the environment.
  - if it can be demonstrated that no significant adverse effects would result.

ii. new and existing facilities - if the permit applicant can demonstrate that inundation of the facility would not significantly exacerbate the damage caused by flood waters.

iii. storage facilities within railroad yards located near major waters and facilities within chemical plants - if inundation of these facilities would create no greater environmental damage than that which would occur by inundation of the railyard or chemical plant themselves.

iv. all facilities - if it can be demonstrated that the facility will not be inundated.

R: The requirement controlling location in regulatory floodways has been dropped because the "no washout" flood standard is deemed sufficiently stringent to provide the same level of protection. Inherent to the no washout standard is the right to locate in a 100-year floodplain (to include the regulatory floodway) provided that the owner or operator can satisfy the standard. Of course no facility will be located within the regulatory floodway if the locality prohibits such development in these areas. Since the National Flood Insurance Program requires communities in the program to restrict development within the regulatory floodway, new hazardous waste facilities would probably be barred from such areas. The RCRA flood standard does not and is not intended to override any local prohibition of development in the regulatory floodway. No standard, therefore, is required.

b. The requirement for an analysis where regulatory floodways have not been designated.

C: (i) Verification by an EPA Administrator of the results of the analysis conducted by industry should be required because this would assure that such results would be both carefully considered and subject to regulatory control.

(ii) The analysis should not be required if the owner or operator can demonstrate that the location of a facility is not subject to regulatory floodway designation.

(iii) Most of the designated regulatory floodways are located in urban areas; however, oil and gas operations are usually located in rural areas. In light of the number of wells drilled each year (48,000 in 1978) and the present oil shortage, analyzing almost all drilling areas would be too costly and time-consuming. Furthermore, an analysis would be unnecessary if EPA does not intend to prohibit drilling of an oil well in a regulatory floodway.

R: The requirement controlling location in regulatory floodways has been dropped for reasons stated above.

c. Unavailabilty/inadequacy of regulatory floodway maps.

C: (i) The maps which have been developed often only take into consideration distance from waterways and do not factor in differences in elevation in determining the boundaries of the floodway.

(ii) The maps are often faulty to the point that regulatory floodways have been designated in areas which are not even within the applicable floodplain.

(iii) In many areas of the country, the designation of regulatory floodways is not complete. Furthermore, few, if any, regulatory floodways were designated when existing facilities were built. Penalizing existing facilities is unnecessarily rigorous.

(iv) Neither the definition nor the regulation provide any guidance as to what precise areas would be or are regulatory floodways. EPA should enable companies to obtain information on regulatory floodways that is pertinent to their facilities.

R: The Federal Insurance Administration (FIA) maps regulatory floodways according to a defined set of procedures. After FIA provides floodway-related data to a community, the community may increase the area which they choose to designate as the regulatory floodway in order to provide greater protection from flooding. Thus, the extent and degree of protection which regulatory floodways provide differs among communities participating in the National Flood Insurance Program. This is one reason that the regulatory floodway would be an undesirable regulatory criterion for EPA to use.

EPA agrees that mapping of floodways is far from complete.

d. Regulation of location in regulatory floodways is inappropriate.

C: The regulatory floodway defined by the FEMA was not developed as a national standard for the location of land disposal facilities and therefore, it cannot be realistically utilized for this purpose.

R: EPA disagrees with the commenter for the protection sought by a regulatory floodway provision is as applicable to FIA programs as it is to RCRA's directive of protection of human health and the environment. As explained above, this protection is provided by the floodplain standard coupled with any local bar on development.

4. Rationale for deletion of the proposed standard

EPA has decided not to promulgate a final standard for locating in regulatory floodways. The information below has prompted EPA to make this decision:

(1) As of July 1979, only 1,000 communities in the NFIP had maps with regulatory floodways delineated. At that time, approximately 16,000 communities were in the NFIP. As a result, it would be difficult to know whether most facilities were in compliance.

(2) Although FIA maps regulatory floodways, the community may extend the boundaries in order to provide greater flood protection to the community. Thus the community has the final word (provided that they are more stringent) in specifying the

extent of the regulatory floodway. As a result, implementation would be non-uniform and non-equitable.

(3) Communities that have floodway maps are required to establish FIA's minimum standards. Section 1910.3(d)(3) of FIA's minimum standards states that a community must, "Prohibit encroachments... within the adopted regulatory floodway that would result in any increase in flood levels within the community during the occurence of the base flood (100-year flood) discharge" (emphasis added).[56] These community standards are applied through a permitting system for all development in the 100-year floodplain; a hazardous waste facility would be subject to that permitting system. As a result, a RCRA requirement would be redundant of the FIA standards.

(4) Regulatory floodways are always within the 100-year floodplain. A hazardous waste facility located in, or planning to locate in, a regulatory floodway would therefore be subject to the 100-year floodplain location standard. Thus, a regulatory floodway requirement would overlap significantly with the 100-year floodplain standard.

EPA believes that regulating development in floodways is probably best left up to communities which have designated regulatory floodway since they must, at a minimum, ensure that FIA's regulations are implemented.

EPA anticipates that problems might arise if a standard was written for location of hazardous waste facilities in regulatory floodways. Problems include the unavailability of maps which would necessitate hydraulic analyses to determine the extent of the regulatory floodway; and then, the potential exists for a community to designate a more extensive regulatory flood at a later date.

Because, according to FIA's minimum requirements, any obstruction in a regulatory floodway which causes any rise in the base flood (100-year flood) elevation is prohibited, EPA anticipates that very few hazardous waste facilities, if any, would be permitted to locate in the floodway. Even fewer facilities would be allowed to locate if the communities adopted more stringent requirements than FIA. Thus, FIA indirectly protects human health and the environment from the potential hazards of a hazardous waste facility locating in a regulatory floodway. Further, EPA's 100-year floodplain standard provides sufficient protection against the washout of hazardous waste in a floodway.

C. Coastal High Hazard Areas

1. Summary of the proposed standard (§250.43-1(c))

The proposed standard prohibited hazardous waste facilities from locating in a coastal high hazard area. However, a discretionary approval of a facility located in a coastal high hazard area was allowed if the facility owner or operator could demonstrate that measures had been taken to ensure that the facility would not be inundated by high velocity waters. "Coastal high hazard area" was defined in proposed §250.41(b)(15) as,

> "the area subject to high velocity waters, including, but not limited to, hurricane wave wash or tsunamis as designated on Flood Insurance Rate Maps (FIRM) as zone VI-30".

In cases where the coastal high hazard zone had not been designated by the Federal Emergency Management Aency (FEMA) the owner or operator was required to obtain an analysis using FEMA-approved methods to determine if the facility is located in a coastal high hazard area.

2. Rationale for the proposed standard

According to FEMA, coastal high hazard areas are those portions of the 100-year floodplain "where flooding is not only most frequent and damaging, but where natural and beneficial values of the land and water interface are at their maximum." (43 FR 6042, February 10, 1978) Because a facility located in these areas would not only be highly susceptible to flooding and wave action, but would also pose a potential threat to these ecologically valuable areas, the intent of the proposed standard was to prohibit facilities from locating in coastal high hazard areas unless they could be engineered to provide needed safety.

3. Comments received

Of the few comments received, several proposed that the analysis required if the facility was located in a non-designated area imposed an unnecessary additional burden. The standard should be limited to areas subject to coastal high hazard designations. A couple of commenters proposed that the degree of hazard presented by the facility be taken into account when determining whether a facility need comply with the standard. One commenter went further and proposed that the standard be entirely dropped because it, when linked to the 500-year flood standard, would adversely affect a large number of facilities, particularly in the Gulf Coast area. Only one commenter suggested that the note be dropped and that there be an absolute ban against placement of facilities in coastal high hazard areas.

4. Deferral of final action

EPA has deferred final action on a specific standard for location in coastal areas because the floodplain standard provides significant, if not complete, protection. All coastal high hazard areas are within the 100-year floodplain and therefore siting in these areas will be subject to control under the 100-year floodplain standard. The 100-year flood in coastal areas is accompanied by some degree of wave action and this wave action must be accounted for when the facility is being designed, constructed, operated, and maintained to prevent washout by a 100-year flood.

With respect to a standard specifically on coastal high hazard areas, EPA recognizes the problems presented by incomplete mapping of coastal areas. Of 1,465 coastal communities in the National Flood Insurance Program, coastal high hazard areas have been mapped for 724 (July 1980 estimate by FEMA). According to FEMA, mapping of all coastal high hazard areas is to be completed by 1983.

For the above reasons, EPA has deferred promulgation of a specific coastal high hazard standard. In the preamble to the Location standards, EPA requests comment on what additional action - beyond the floodplain standard - the Agency should take in order to protect human health and the environment in coastal areas. EPA will continue to investigate this problem with FEMA and those in charge of implementing the Coastal Zone Management Act, 16 U.S.C. 1451 *et seq*.

D. Floodplains

1. Summary of the proposed standard (§250.43-1(d))

The proposed standard prohibited the location of hazardous waste facilities in a 500-year floodplain. However, the owner or operator of a facility could obtain a discretionary approval to locate in a 500-year floodplain if he could demonstrate at the time of permit issuance that the facility would not be inundated by a 500-year flood. The 500-year flood was defined in proposed §250.41(b)(31) as,

> "a flood that has a 0.2 percent or one in 500 chance of recurring in any year. In any given 500-year interval, such a flood may not occur, or more than one such flood may occur."

2. Rationale for the proposed standard

Disposal of hazardous waste in floodplains may have several significant adverse impacts: (1) If not adequately protected from flooding, wastes may be inundated by water and flow from the site, contaminating downstream waters; (2) Since floodplains generally have hydraulic connection to wetlands, surface water, and ground water, location of hazardous waste facilities in floodplains may result in leachate contamination of ground water; (3) Development in the floodplain may restrict the flow of flood water, causing greater flooding upstream; and (4) Development in the floodplain may reduce the size and effectiveness of the flood-flow retaining capacity of the floodplain, which may cause a more rapid movement of flood waters downstream, resulting in higher flood levels and greater flood damages downstream.

The Agency sought to make the standard consistent with the U.S. Water Resources Council (WRC) Guidelines for Implementing Executive Order 11988, "Floodplain Management" (43 FR 6030-6055, February 10, 1978). While the guidelines use the 100-year floodplain as its basic level of protection, a greater level of protection is suggested for critical actions. The WRC Guidelines define "critical actions" as those actions for which even a slight chance of flooding would be too great. The Guidelines further explain that a key question to ask in determining whether an action is critical is:

> If flooded, would the proposed action create an added dimension to the disaster as could be the case for liquefied natural gas terminals and facilities producing and storing highly volatile, toxic, or water reactive materials? (43 FR 6043)

Hazardous waste facilities seemed to meet this definition.

The intent of the proposed standard was to prohibit placement of facilities within the floodplain unless the facility owner or operator could demonstrate that the facility was engineered and located so as not to be inundated by the 500-year flood.

3. Response to comments

a. The definition of floodplain

C: The definition of "floodplain" should define the concept in general, and should not include reference to a specific frequency of occurence.

R: EPA agrees that the term floodplain should be generally defined. For purposes of regulation, however, a frequency must be stated so that the limits of the area subject to the requirement and the elevation of the flood can be determined. In the floodplain standard, the Agency has defined the 100-year flood and the 100-year floodplain.

C: The Agency's definition of floodplain is inconsistent with E.O. 11988.

R: EPA's proposed definition was consistent with the E.O. except for an error in transcription. The word "areas" was erroneously substituted for "waters".

b. Executive Order 11988, "Floodplain Management" and WRC's Guidelines

C: The E.O. makes no specific mention of a "500-year floodplain", and gives EPA no authority to regulate them. The E.O. defines floodplains as areas subject to a "one percent or greater chance of flooding in any given year," i.e., a 100-year floodplain. Therefore, the 100-year flood should be used as the criterion in the floodplain standard in order to be consistent with the terms of the E.O.

R· The commenter is correct in stating that E.O. 11988 only refers to the base or 100-year flood. The final standard is consistent with the E.O. in specifying the 100-year floodplain as the minimum floodplain of concern. There may be situations where greater protection is warranted. EPA is separately considering whether a stricter standard is warranted for certain situations. Such a change will be subject to a separate rulemaking procedure and therefore opportunity for public comment.

C: The E.O. is directed exclusively to Federal Government agencies and not to private industry. If EPA wishes to apply the terms of the E.O. to private industrial facilities by analogy, it should offer at least some plausible reason for doing so.

R: EPA does not rely on the Executive Order to regulate private industrial facilities in flood prone areas. The authority to so regulate is found in Section 3004 of RCRA.

The Executive Order requires Federal agencies to include provisions for the evaluation and consideration of flood hazards in the regulations and operating procedures for licenses, permits, and loan and grantin-aid programs it administers (Sec. 2(c)). EPA considers the floodplain standards as satisfying Section 3004 while being consistent with the Executive Order.

C: Reliance by EPA upon the Executive Order is subject to challenge because no EIS was prepared for the E.O. nor was any notice published or public hearings held on the E.O. as mandated by Section 4 of the Administrative procedures Act. For these reasons, the E.O. is null and void, and therefore, it has no binding effect upon any Federal agency in developing its regulations, permit issuing procedures, or policies.

R: The Executive Order was not the basis for specifying floodplain protection as discussed in response to the first comment.

C: Reliance by EPA upon WRC's Guidelines to implement the Executive Order is subject to challenge because although the the Executive Order provides that Federal agencies must incorporate the existing procedures of the Unified National Program for Floodplain management of the WRC into their regulatory structures (Section 2(d)), the Executive Order does not give the WRC authority to create general new "guidelines" which go beyond the scope of the Executive Order (i.e., the Executive Order only refers to the 100-year floodplain). WRC's authority under the E.O. is limited to "guidance" regarding the location of floodplains where existing maps of the Federal Insurance Administration do not adequately delineate the location of a floodplain

(Section 2(a)(1)).

R: The Agency's proposed 500-year floodplain standard was based on the need to protect human health and the environment from inundation of hazardous waste management facilities by floods. Thus EPA was relying on its own authority and mandate under Section 3004 of RCRA and not on either the E.O. or WRC's Guidelines. EPA believes it is implementing the spirit of both by attempting to protect human health and the environment from the consequences of inundation of hazardous waste management facilities by most floods.

C: EPA has improperly applied the Guidelines to implement the E.O. because whether or not a Federal action is a "critical action" must be determined on a case-by-case basis. To properly follow the requirements of the Guidelines, EPA should have structured the proposed rules so as to allow for a case-by-case determination of what constitutes a "critical action".

R: The final standard requires a case-by-case evaluation to determine whether the no washout requirement has been satisfied. As mentioned above, EPA is considering a separate rulemaking procedure to determine whether a requirement stricter than the 100-year flood standard should be imposed for special situations and if so how that would be accomplished. There is insufficient data to justify such a standard at this time.

C: The E.O. contains no prohibition on the siting of facilities in 100-year floodplains. Instead, it requires careful consideration of alternatives and minimization of potential harm, both of which are consistent with limiting the coverage of this standard to 100-year floodplains.

R: The proposed regulation was not an outright prohibition but included a variance "note" allowing such location upon demonstration that inundation of the facility would not occur.

c. Information utilized in mapping the 500-year floodplain and flood insurance maps

C: Because historical flood data in the United States varies from none to a maximum of 120 years, it is impossible to calculate, statistically or technically, an accurate 500-year floodplain. In other words, extrapolation to 500-years results in considerable uncertainty when estimating the height of inundation and the lateral extent of the 500-year flood.

R: EPA agrees that there is considerable uncertainty involved in mapping the 500-year floodplain because available data must be extrapolated to 500 years. This one principle reason EPA has used the 100-year flood as the final requirement.

C: Where extrapolation of data is used in determining the 500-year floodplain, there will be room for considerable debate by various sources and authorities. Because of the unavailability of information, and the margin for debate, the more commonly accepted 100-year floodplain restriction should be used.

R: EPA agrees that using the 500-year floodplain as the minimum floodplain of concern would have resulted in more controversy over the boundaries of the floodplain of concern. Because the 100-year flood is the standard, the commenter's point is no longer of concern.

C: The study and research required to determine a 500-year floodplain would, in most cases, be prohibitively costly, particularly in the Western United States where there is a dearth of rainfall and flood records. The 100-year flood should be the standard flood.

R: The amount of study and research required to determine a 500-year floodplain would probably not be much more than that required to determine a 100-year floodplain because the records available are finite. However, the accuracy of the determination would suffer and the cost would be greater because of the degree that available data would have to be extrapolated to determine the 500-year floodplain.

C: EPA agrees that if all facilities were made to comply with a 500-year floodplain requirement there would be a delay because 500-year floodplain maps are not widely available. A 1979 estimate was that only 3,000 of the 16,876 communities participating in the National Flood Insurance Program had Flood Rate Maps (FIRM) which delineated the 500-year floodplain.

C: Maps which delineate the 500-year floodplain have not been developed for many sections of the country and will not be ready for 3-5 years. Nearly 90% of all FEMA flood maps are Flood Hazard Boundary Maps (FHBM), which delineate only the boundaries of the 100-year floodplain. A 100-year, or more frequent, floodplain should be established as the criterion.

R: See response to previous comment. One of the reasons that EPA has established the 100-year floodplain as the floodplain of concern is because maps which delineate the 100-year floodplain are available for more flood prone communities.

C: The floodplain restriction should be deleted because no reliable generalized floodplain map currently exists for either the 100-year or 500-year floodplain.

R: The Flood Insurance Rate Maps (FIRM) produced by the Federal Insurance Administration are based on the best available data and statistical techniques. These maps will be discussed later. EPA believes that the 100-year floodplain criterion is necessary to protect human health and the environment.

C: Using Flood Insurance Rate Maps is inappropriate because they are not based on accurate, technically sound engineering surveys.

R: FIRM's are based on available historical information, hydrological analyses (to obtain flood flow frequency) and hydraulic analyses (to obtain flood elevations). The FIRM's are prepared by professional engineering firms which must follow a detailed guidance manual given to them by FIA. They are the best and most reliable maps that are widely available.

C: Because flood insurance maps generally do not delineate floodplains less than 200 feet wide, no information is available for small streams and tributaries. This lack of information will make it extremely difficult to make siting decisions for new power plants and associated disposal facilities.

R: EPA will require an owner or operator to determine if his facility is located in the 100-year floodplain if the floodplain is less than 200 feet wide and not mapped. Mapping procedures are sufficiently detailed by the Federal Insurance Administration so that an owner or operator can determine if this facility is within a 100-year floodplain.

C: The method of predicting a 500-year flood should be stated and explained.

R: EPA agrees that some guidance should be given to owners or operators on how to determine a 100-year flood and floodplain. A guidance/permitting manual for the Location standards will be available shortly after these regulations appear in the Federal Register. This manual will provide information on how to determine the elevation of the 100-year flood.

d. The impacts of the proposed standard

C: The standard will have a substantial impact on existing facilities that need to be near a source of water (e.g., NPDES treatment facilities that discharge to waters of the U.S., chemical plants and refineries, and vessel cleaning plants); most of them are in the 500-year floodplain.

Possible consequences are that these facilities would:

- be unable to comply, even on a compliance schedule.
- experience a competitive disadvantage.
- have to sustain tremendous moving costs.
- have to close because of the monumental financial impact even if the facility was well designed and environmentally sound.

R: EPA believes that the impacts on existing facilities that need to be near a source of water will be greatly reduced because: (1) the floodplain of concern is now the 100-year floodplain, and (2) existing facilities need not comply until they are required to file an application for Part B of their RCRA permit. At that time these facilities need not be moved. They are to be modified if they do not comply with the standard as soon as possible in accordance with a compliance schedule. Since all facilities must comply, there are no competitive advantages to any firm.

C: The 500-year standard is overly restrictive by eliminating substantial sections of the country as potential sites for new facilities. This result is not in the public interest in light of the shortage of suitable sites which meet the other Section 3004 requirements.

R: By reducing the floodplain of concern to the 100-year floodplain, there will be less restriction on the siting of new facilities. New facilities are not prohibited from locating in 100-year floodplains in this rule, but rather are required to design their facility to prevent washout by the 100-year flood.

C: This standard is overly restrictive for Florida. It is estimated that as much as 80-90% of the State would be in the 500-year floodplain. It is recommended that the 100-year floodplain be used because it is mapped extensively by several agencies and data is available. Others commented that the entire Houston-Galveston area, not to mention the rest of the Gulf Coast, is included within a 500-year floodplain. It should be noted that the nation's largest concentration of refineries and petro-chemical plants and the chlor-alkali industry is located in that area. The 500-year requirement alone could preclude the use of many acceptable and safe sites for disposal of hazardous wastes.

R: EPA agrees and has adopted the 100-year flood standard. EPA is aware of the concentration of industry on the Gulf Coast. The regulations now require that these existing facilities comply with the 100-year flood standard as soon as possible after applying for a RCRA permit or that the owner or operator satisfy the variance provision.

C: The possibility of a 500-year flood is very remote and does not justify the expense and limitation placed on otherwise available sites. Furthermore, it seems to exceed the degree of restriction necessary to protect human health and the environment in the siting of new facilities. The 100-year floodplain should be used.

R: Available data presently only justifies the use of the 100-year standard. This standard is widely used by other Federal agencies and states.[57]

There may be particular wastes or facility types or combinations thereof which justify a greater degree of protection. Such situations are being considered in a separate rulemaking.

e. Suggested alternatives to the proposed standard

C: The 500-year floodplain should be used only where sufficient data exist. In other areas, a minimum of a 100-year floodplain or a maximum of a 200-year floodplain should be used if sufficient information is available.

R: EPA cannot be more or less stringent with respect to locating in floodplains simply on the basis of how much information is available on a floodplain. Under this approach, identical facilities would be subject to different degrees of restriction depending upon how much information was available for a particular floodplain. If the commenter intended that the floodplain of concern should be determined by both availability of data and the type of facility; EPA does not have sufficient data to tailor the standard to facility type.

C: Because data for accurately determining the elevation of the 500-year flood are limited and because many industrialized areas are already within the 500-year floodplain, EPA should reduce the required floodplain elevation to a more reasonable level taking into account available data and relative potential for disaster.

R: EPA has adopted the 100-year floodplain for reasons already discussed above.

C: Commenters stated that the 100-year floodplain should be used because: (1) flood level information is available and verified in many cases, (2) it would provide adequate protection, (3) it is economically justifiable, (4) more land would be available for siting, (5) the possibility of a 500-year flood is remote, and (6) the 500-year floodplain is not a recognized design tool.

R: EPA agrees with many of these comments. While the Agency recognizes that a 500-year standard would afford a higher level of protection, at present the Agency does not have sufficient information that would justify a need for the added level of protection over that provided by the 100-year floodplain standard. The 100-year flood is the most widely used standard in various Federal and state programs addressing the hazards associated with flooding. Of twenty four states that regulate floodplains, eighteen use the 100-year flood as the regulatory standard. The Federal Insurance Administration, and the U.S. Army Corps of Engineers have adopted the 100-year flood as their standard on which to base floodplain management measures.[58] Because of this common use, engineering expertise in designing for the 100-year flood is available.

C: EPA should specify the 100-year floodplain or the greatest flood on record, whichever is greater.

R: EPA believes that specifying the 100-year floodplain in all cases is a more reliable determination and it ensures a greater degree of equality in regulating facilities. The greatest flood on record is not a good tool to use in regulating because the degree of restriction would be almost solely dependent upon the number of years that elevations of floods have been recorded.

C: The 50 to 100-year floodplains should be specified in view of the protection afforded by flood control measures such as dikes, dams, and levees now in existence.

R: One reason that the 100-year floodplain was specified in the final rule is that it is used as the floodplain of concern in many states and other Federal agencies, and accordingly it is a common design tool which flood control measures now in existence can protect against.

C: The 50-year floodplain should be used because sufficient data are available to accurately define the range of this area, and because it would be a more realistic design parameter.

R: EPA believes that the 100-year floodplain standard will provide the minimum level protection to human health and the environment in the case of hazardous waste facilities. A 50-year standard would result in an unacceptable frequency of flooding and in an unacceptable degree of damage in the event of a larger flood.

C: The 10-year floodplain should be used because;

(i) it can be readily determined, and

(ii) here a true potential exists for environmental problems as the result of siting a new hazardous waste treatment, storage, or disposal facility.

R: The response to the previous comment applies here.

C: State agencies should determine floodplain requirements based on scientifically justified and site-specific criteria.

R: RCRA (§3004) requires that EPA promulgate regulations with respect to location in order to protect human health and the environment, and §3006 requires that States which receive final authorization must have requirements that are equivalent to EPA's. As stated before, EPA believes that the minimum floodplain of concern cannot be less than the 100-year floodplain. Of course, a State may specify a more stringent requirement (e.g., a 200-year or a 500-year floodplain) if it believes that a greater degree of restriction is necessary to protect human health and the environment in that State and if it believes the requirement can be adequately implemented.

C: EPA should specify that location will be restricted in an area subject to greater than a one percent chance of flooding in any given year. This requirement would allow for flood prevention measures to be taken into account whereas the proposed approach (i.e., specifying a certain year floodplain) did not. For example, it is unclear whether the definition of a 500-year flood would change if flood prevention measures were to prevent its occurance.

R: The definition of a 100-year or 500-year flood would not change if flood prevention methods were to "prevent" its occurrence but the area defined as the 100-year or 500-year floodplains would change. For example, if dikes or levees were constructed in an area which was defined to be within the 100-year floodplain and because of such construction the area was no longer susceptable to being flooded by the 100-year flood, that area would thereafter not be considered to be within the 100-year floodplain.

C: Floodplain restrictions should be developed according to facility type (i.e., land disposal or thermal treatment facility) taking into account type and amount of waste. For example, secure landfills should never be allowed to locate in a 500-year floodplain.

R: EPA believes that the 100-year floodplain is the minimum floodplain of concern for all hazardous waste facilities. In the future, EPA may specify a less probably flood for wastes or facility types that it deems require more protection in order to protect human health and the environment. At present, data are not available to tailor the standard to particular facility types.

C: The standard should specify the 100-year floodplain, and it should only apply to facilities which manage very hazardous waste. The amount of water from a 500-year flood will have substantial dilution capability, such that most marginally hazardous waste will be rendered non-hazardous before it crosses the property line.

R: See response directly above. In general, the dilution capacity of a 100-year flood is less than that of a 500-year flood. However, the Agency has no data on the degree wastes would be diluted and thereby be rendered innocuous before they cross the property line. This would be a highly variable phenomenon which does not lend itself to a universal regulation.

C: The standard should only apply to land disposal facilities because the emplaced waste will be inundated eventually.

R: See previous responses.

C: A case-by-case evaluation of each facility should be undertaken so that, for example, on-site storage awaiting pickup or treatment (including incineration) is not unnecessarily forbidden.

R: The permitting official will have to review each RCRA application with an understanding of the types of operational units at the facility in order to determine if the owner or operator is in compliance with the 100-year floodplain standard. No hazardous waste management activity is outright forbidden in the 100-year floodplain standard.

f. The variance to the proposed standard

C: The meaning of the term "inundated" is unclear, making the variance provision subject to various interpretations.

R: The proposed standard would have allowed the placement of a facility within a 500-year floodplain if the applicant would demonstrate that no inundation by flood waters would result. Protection from inundation is not the only method of protecting the environment and the public from the effects of flooding. Other measures involve flood proofing, which allows the waters to inundate the facility, but prevents the hazardous waste from leaving the facility. Proper anchoring or elevation of containers may in fact be less expensive than the construction of dikes or flood walls which the same level of protection would be provided. Thus, the inundation provision was dropped in favor of the washout provision with the effect of expanding the means by which owners or operators could comply with the standard.

C: Allowing facilities that would not be inundated to locate in the 500-year floodplain is not practical because:

- it is impossible to guarantee beyond all shadow of a doubt that a facility will not be flooded;

- large volume sites would be required to construct prohibitively expensive dikes or berms, and
- it would preclude the use of sites that would only be inundated for a few hours with no lasting adverse impact.

The commenter that supplied the last reason suggested that the "Note" be changed to require that the facility not be inundated by the 100-year flood, and so that any inundation by a 500-year flood will not cause a significant impact on the environment.

R: EPA has concluded that sufficient flood technologies exist to provide protection against flooding. Thus, EPA has eliminated the presumption against locating within a floodplain in favor of showing that adequate technologies are used to protect against washout.

EPA has concluded that inundation of a site should not be the sole criterion. Flood proofing is also effective where flood waters reach the facility, but due to adequate anchoring or elevation of tanks and incinerators for example, the wastes are not washed out. Washout, the standard adopted, can be satisfied either by preventing inundation or by flood proofing.

The difference between inundation and washout of waste is illustrated in the Guidance Document for the Classification of Solid Waste Disposal Facilities;

> "A facility protected against inundation is not necessarily protected against washout of the waste. A facility can be inundated without washing out, and washed out without being inundated. The former occurs when waste is covered or held by vegetated soil, and the base flood inundates the surface but does not erode and wash out waste. The latter can occur when the facility is diked or the waste covered up to the 100-year level, but the dike or covering is insufficient protection and the waste is eroded and carried away." [59]

C: If upstream flooding is a concern, the note should be written to require an economic and safety evaluation to demonstrate that excessive cost prevents locating the facility elsewhere and that the risk to human life is within acceptable limits.

R: Upstream flooding is always a concern in a comprehensive floodplain management program. However, in these rules, EPA has only considered upstream flooding in an indirect way. For example, by preventing incinerators and containers from being washed away, potential problems of blocking the flow of flood waters is reduced. EPA has left direct regulation of concerns that determine the extent of upstream flooding to local and State governments.

C: A variance to the standard should be granted under each of the following conditions:

- if inundation of the facility would not significantly exacerbate the damage caused by the flood waters.
- if it can be shown that hazardous waste will not be released to the environment if the facility is flooded.
- if inundation of the facility will not cause a significant adverse impact on the environment.
- if it can be demonstrated that applicable environmental protection standards will not be violated.
- if inundation of the facility will not present an environmental or public health hazard either because of the inherent characteristics of the facility design or because of the nature of the contingency plans that will be activated if flooding is threatened.
- if contaminated ground water conditions already exist.
- if the facility is located on waterways that are flow or level controlled, such as the rivers in the TVA system.
- if inundation of an on-site facility will create no greater environmental damage than that which would occur by inundation of the

plant of which the facility is a part.

- if adequate design criteria are present, based on site-specific analysis.
- if there is no practicable alternative to location in the floodplain, and if all practicable measures have been taken to minimize harm to or within the floodplain (such an analysis is required in E.O. 11988). In making these findings EPA should take into account economic, environmental, and other pertinent factors.

R: The proscriptive part of the final standard, which requires that facilities within the 100-year floodplain must be designed, constructed, and operated and maintained to prevent washout of any hazardous waste, is consistent with the comment that facilities should be allowed to locate in the floodplain if it is shown that hazardous waste will not be released to the environment if the facility is flooded, and with the comment that suggested a variance based on a case-by-case analysis of the facility's design.

EPA does not agree that a facility should be allowed to locate in a floodplain if contaminated ground water conditions already exist. EPA does not sanction further degradation of ground water. Furthermore, hazardous waste in flood waters may adversely impact other facets of human health and the environment such as life adjoining wetlands and streams and potable groundwater some distance from the facility. Therefore, contaminated ground water should not be a variance condition.

Another issue concerns facilities that are located or want to locate in floodplains alongside waterways that are flow or level controlled. If a facility is located in a 100-year floodplain where the stream or river is contained during the 100-year flood by a system of dikes, levees, berms, revetments, or other structures such that the natural 100-year floodplain is no longer subject to flooding by the 100-year flood, then the facility is in compliance with the final floodplain standard.

The hazard presented by an on-site facility is the same as that presented by an off-site facility. Because an industrial plant may be flooded is no justification for not requiring the hazardous waste facility to be protected from flooding.

EPA has chosen not to prohibit facilities from locating in the 100-year floodplain if a practicable alternative exists because EPA believes that if the facility complies with the floodplain standard, then human health and the environment are adequately protected.

g. Comments specific to the proposed "special wastes"

Summary of comments

- This standard is unreasonable for a lead smelter furnace slag pile because there would be no measurable damage to the environment due to the low solubility of the slag material. There should be an exemption for these and other facilities, which, if flooded, would not adversely affect human health and the environment.
- This standard is overly broad and inappropriate for new power plants and associated disposal facilities.
- Special waste disposal facilities should not have to comply with this standard because it has been estimated that 64% of existing electric utility generating stations are located in floodplains. In addition, it is expected that Major Fuel Burning Installations (MFBI's) are located in floodplains because, like electric utilities, they are dependent on water resources for cooling, and often use coal transported by barge. Piping in water would be costly and may result in additional impacts.
- Utility wastes such as fly ash and bottom ash are not volatile, corrosive, reactive or

toxic. If a 500-year flood did occur, these wastes would not be of much concern. For these reasons, this restriction is unreasonable.

○ In the Southwest, copper mining wastes are deposited in gulleys, ravines, and arroyos (flow areas) in desert regions. During rain storms, run-off from the desert flows into these drainage areas. It is impossible to pile this enormous amount of material on the ridges that separate these gulleys.

○ If metal mining wastes are deemed hazardous under the Act, most of that industry may have to cease operations because mining wastes are quite often located in or near natural stream drainages which may be in the 500-year floodplain.

Response to comments

As a result of Congressional amendment to the Solid Waste Disposal Act, regulation of many proposed special wastes has been temporarily deferred. The effects of disposal of these wastes on human health and the environment are being studied. The results of these studies will determine if the wastes will be regulated under Subtitle C.

The deferred wastes include:

(1) Fly ash waste, bottom ash waste, slag waste,

and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels.

(2) Solid waste from the extraction, beneficiation, and processing of ores and minerals, including phosphate rock and overburden from the mining of uranium ore.

(3) Cement and kiln dust waste.

(4) Drilling fluids, production waters, and other wastes associated with the exploration, development, or production of crude oil or natural gas or geothermal energy.

In the interim, these wastes would be subject to regulation only under applicable provisions of other State and Federal laws. However, Congress has directed EPA to protect human health from exposure to radioactive wastes which are used in construction and land reclamation. These solid wastes include wastes from the extraction, beneficiation, and processing of phosphate rock, and overburden from the mining of uranium ore.

With respect to the comment on existing electric utility stations: the proposed site selection standards only applied to new sources of utility waste and did not apply to existing utility waste disposal facilities. The commenter misunderstood the proposed utility waste standards.

h. Miscellaneous comments

C: Pursuant to the Federal Water Pollution Control Act (FWPCA) amendments of 1972, all industrial wastewater treatment facilities must be designed and constructed to withstand the 100-year flood. EPA is reversing past policy which has resulted in the expenditure of millions of dollars.

R: The FWPCA amendments of 1972 do not require all industrial wastewater treatment facilities to be designed and constructed to withstand the 100-year flood. However, the Flood Disaster Protection Act of 1973 (Pub. Law 93-234, December 31, 1973) requires, with certain exceptions, that grantees purchase flood insurance on or after March 2, 1974, as a condition of receiving any form of Federal assistance for construction purposes. Thus, receipt of construction grants for municipal wastewater treatment facilities is contingent upon compliance with applicable flood insurance regulations (see 40 CFR 30).

C: The environmental damage created by the flooding of a facility by a 500-year flood will be insignificant in relation to other environmental damage caused by the flood waters from such a storm.

R: Flooding of a facility by the 100-year flood has the potential to cause environmental damage. The actual damage is of course dependent upon facility specific wastes involved.

C: EPA should consider the costs required for compliance against the environmental benefits achieved. For example, petroleum industry disposal sites, and water treatment facilities appear to pose little risk to the environment while retrofitting these facilities would cost billions.

R: Since protecting facilities against the 100-year flood is widely used in other Federal programs and by many States, the costs presumably are not prohibited. EPA, in the case of existing facilities, will provide a reasonable period of time during which an existing facility is to come into compliance. Cost burden, presumably, will be taken into account setting the compliance schedule.

C: Hazardous waste facilities *can* be designed and constructed in a manner that will protect human health and the environment even in the event of a 500-year flood.

R: EPA agrees that technologies are available to protect against the 100-year flood. The data are not as convincing for the 500-year flood because of the limited experience with such floods.

C: The selection of the 500-year floodplain as a siting criterion appears arbitrary and capricious and it is not supported by data.

R: EPA acknowledges that almost no data exist on the 500-year flood and its effects. For this reason

C: EPA should consider the costs required for compliance against the environmental benefits achieved. For example, petroleum industry disposal sites, and water treatment facilities appear to pose little risk to the environment while retrofitting these facilities would cost billions.

R: Since protecting facilities against the 100-year flood is widely used in other Federal programs and by many States, the costs presumably are not prohibited. EPA, in the case of existing facilities, will provide a reasonable period of time during which an existing facility is to come into compliance. Cost burden, presumably, will be taken into account setting the compliance schedule.

C: Hazardous waste facilities can be designed and constructed in a manner that will protect human health and the environment even in the event of a 500-year flood.

R: EPA agrees that technologies are available to protect against the 100-year flood. The data are not as convincing for the 500-year flood because of the limited experience with such floods.

C: The selection of the 500-year floodplain as a siting criterion appears arbitrary and capricious and it is not supported by data.

R: EPA acknowledges that almost no data exist on the 500-year flood and its effects. For this reason

EPA has modified the standard to the more commonly used 100-year flood.

C: If wastes are properly stabilized or encapsulated or neutralized, EPA should permit the use of environmentally sound disposal in the 500-year floodplain.

R: Facilities are allowed in 100-year flood plains if they can meet the no washout standard or the variance (hazardous waste safely carried away). The standard does not allow a variance if the wastes are stabilized or neutralized. Consideration will be given to such variations in a separate rulemaking which will be subject to public comment.

4. Rationale for the floodplain regulation

a. Hazards associated with location

Locating hazardous waste facilities in floodplains may have several significant adverse effects on human health and the environment: (1) wastes which are exposed to flood waters (e.g., in piles, surface impoundments) may produce more leachate, and be washed out and carried variable distances from the site, thus creating a potential for contaminating surface water, ground water, aquatic life, and soils, or directly affecting human health by direct contact; (2) tanks, incinerators, and treatment units may not be capable of resisting the hydrostatic and hydrodynamic loads (inclucing the effects of buoyancy) and thus, the structure may be weakened by seam failures and/or may be physically dislocated; and (3) containers may be carried away by flood waters, and opened or caused to leak, or they may be handled at their new location by persons who are not aware of the hazardous nature of the contained waste.

As discussed in Section II of this document there are some documented instances of flood damage to hazardous waste management facilities. The following documented incident concerns drums (i.e., containers) being carried away from a reclaiming facility that is located in a 100-year floodplain.

In July 1975 in Mount Holley, North Carolina, drums containing wastes from a chemical reclamation plant were washed downstream in Fites Creek by heavy rains. No fish kills were reported although an unusual odor emanated from the creek.[60] The plant subsequently went out of business and closed.[61]

The following damage incident is the subject of a pending civil action. The alleged damages presented below are exacerbated by frequent flooding of the site.

The Brooklawn site, containing four or five pits or ponds, is located in East Baton Rouge Parish, Louisiana. It contains a variety of chlorinated hydrocarbons, organic chemicals of the anthracene/phenanthracene groups, styrene tars, vinyl chloride, lead, silver, and chromium. In one sample taken at the site, the total chlorinated hydrocarbon organic fraction is almost 11,000 parts per million. The site is low-lying, swampy, and is in the floodplain of the Bayou Rouge and the Mississippi River. Floods regularly inundate the site, carrying the stored wastes away from the property. These wastes have escaped into the Bayou Baton Rouge, Devil's Swamp, and the Mississippi River. These chemicals allegedly are destroying and have destroyed near wildlife habitats, especially marsh and swamp lands, making them uninhabitable for animal and vegetative life. Many animals, including fish, alligators, turtles, cattle, and birds have already been killed. Considerable numbers of trees and other plants have been killed.[62]

The next two damage incidents involve pits and lagoons that are located in 100-year floodplains. Both of these incidents could possibly have been prevented if 2 feet of freeboard were maintained or if a secondary containment system was available. However, taken together, these four instances illustrate the potential for harm to human health and the environment when a facility is located in a 100-year floodplain.

In November 1970, sludge from an oil reprocessing plant in Douglassville, Pa. was released to the Schuylkill River after heavy rains caused one of the walls of a lagoon to break. When Hurricane Agnes flooded the Schuylkill in June of 1972, the waters flowed over the tops of the lagoons, carrying more sludge to the river and causing further damage downstream. The trees and waters of the river were left coated with oil following the incident. Since June 1972, there have been minor releases of oil sludge to the river due to flooding, but nothing of the magnitude of the damage caused by Hurricane Agnes.[63]

An eleven-acre chemical waste site in Lamarck, Texas was the location of a waste overflow in 1961 due to heavy rains which accompanied Hurricane Carla. This site consists of approximately 7 pits (each 12 to 25 feet deep) with earthen dikes. The pits contained such industrial wastes as tars, acids, chlorides, catalysts, lead and mercury. Heavy rainfall causes the pits to overflow and drain into ditches which connect with Highland Bayou. The waste site was closed in 1976, and cleanup efforts are underway.[64]

Locating any structure in a floodplain will additionally (1) restrict the flow of flood water usually causing greater flooding upstream, and (2) reduce the natural valley storage of the floodplain which may cause greater discharges which in turn cause higher flood levels and greater flood damages downstream. Because these are general concerns (i.e., they apply to all structures), which are dependant on the physical characteristics of a particular channel and watershed, and the degree of floodplain development, EPA believes that it is logical for local laws and zoning ordinances to regulate floodplain development with respect to these general concerns. Communities participating in the NFIP are required to promulgate regulations which take into account the degree of flood-flow restriction and the retaining capacity of the floodplain. The floodplain regulation in these Location standards is tailored to preventing damages that may result if a hazardous waste facility is located in a 100-year floodplain.

b. The One-Hundred-Year Flood

EPA cited the minimum floodplain of concern as the 500-year floodplain in the proposed rule. The numerous comments received on this standard have been answered individually in a previous section of this document. Commenters most frequently suggested that EPA use the 100-year floodplain as the minimum floodplain of concern. Reasons given were that; (1) flood level information is available and verified in many cases, and thus (2) there would be less of a margin for debate in boundary determinations (compared to the 500-year floodplain), (3) it is consistent with the degree of restriction necessary to protect human health and the environment, (4) more land would be available for siting new facilities, (5) it is economically justifiable, and (6) it is consistent with Executive Order 11988.

Other commenters suggested that the 50 and 10-year floodplain be specified. The overriding reasons given were that information is available to accurately determine these floodplains and that facilities can be designed to be protected against that degree of flood hazard. EPA has rejected these commenters' suggestions because EPA believes that the 10 and 50-year floodplains represent too high a probability that the land area will be flooded, particularly in the case of land disposal facilities where leachate production is a concern. Also, these higher probability floodplains will be particularly hard hit in the event of a larger flood.

EPA has specified the 100-year floodplain as the minimum floodplain of concern in the standard. Comments on the proposed rule were the major factor in EPA's decision. EPA met with various Federal Insurance Administration (FIA) employees to investigate the validity of commenters' concerns and suggestions. FIA was particularly helpful with technical matters and in providing us with information on the National Flood Insurance Program (NFIP) and on the availability of floodplain maps. Flood Hazard Boundary Maps (FHBM) have been prepared for nearly all (e.g., except for approximately five) communities that have been identified as flood prone (i.e., any land area susceptible to being inundated by water from any source[65]) by FIA.[66] The FHBM delineates the boundaries of the 100-year floodplain but does not give elevations. There were approximately 20,238 communities identified as flood-prone as of July, 1980.[67] If a 100-year flood level is not available from another source, it can be determined from the FHBM. A qualified hydrologist will be able to make this determination with less than a days work or FIA can be contacted to aid in determining the 100-year flood elevation at a particular location.[68] Of the 16,876 (estimate as of July, 1980) communities that have been accepted into the National Flood Insurance Program approximately 4,846 have Flood Insurance Rate Maps (FIRM)[69] which delineate the 100-year floodplain with flood elevations. Where these maps are available, determining if a facility is located in a 100-year floodplain should be a simple task.

Because a uniform set of maps is available from FIA for nearly all flood prone communities the 100-year floodplain standard will be easier to comply with and there should be fewer disputes over boundary determinations.

By specifying the 100-year flood, EPA is also maintaining consistency with E.O. 11988, FIA, and most States. A booklet published by FIA on the NFIP states that the 100-year flood standard,

> "...is used by Federal agencies in the administration of programs as they relate to the floodplains. In addition, the same standard is required either by law or regulation in most States and is used in the administration of State programs in virtually every State."[70]

Because the 100-year floodplain is the most commonly used standard in Federal and State program the final standard should be easier to implement as engineers will be familiar with the parameters involved in designing, construction, or retrofitting a facility.

Until other data are presented to the Agency indicating the need for a different minimum flood level, the 100-year flood has been selected as the minimum flood for this rule. However, EPA does not conclude that this level necessarily is sufficient protection for human health and the environment for all hazardous waste management facility situations. EPA is currently considering issuance of a proposed rule that would allow the Regional Administrator to require more stringent standards where circumstances would so warrant. Such a change though is not part of this rulemaking.

FIA usually does not map floodplains that are less than 200 feet wide; therefore, mapped information would probably not be available for floodplains less than 200 feet wide. FIA does not (normally) map floodplains that are less than 200 feet wide for the following reasons:

(1) This width typically represents a transition zone where flooding becomes a drainage problem and is controlled by culverts or sewers. Culverts and sewers are extremely expensive to evaluate hydraulically.

(2) The hazard represented by such a stream flooding is typically not great because only shallow flooding is experienced.

(3) Floodplains less than 200 feet wide are frequently subject to local zoning ordinances and easements.

(4) Alteration of natural drainage systems and the watershed frequently occurs during development which would result in FIA having to frequently reevaluate the floodplain.[71]

Where FIA omits an area because of the 200 foot exclusion, the owner or operator will have to determine if his facility is within the 100-year floodplain. FIA mapping procedures may be used to make this determination.

Another issue concerns the permanence of a 100-year floodplain. In other words, "the 100-year floodplain is not fixed; it is subject to changes caused by future urban development and flood control improvements, including physical structures and land conservation practices, i.e., it may expand or contract in the future."[72] If the elevation of the 100-year floodplain is reevaluated such that a facility which was previously outside of the 100-year floodplain is now within the floodplain, the owner or operator, probably when the permit expires or upon notification from the permit issuer, will have to modify the facility to comply with the standard. The owner or operator and the permitting authority can work out a reasonable time period to achieve compliance.

c. The standard

In developing a floodplain standard, EPA ruled out a prohibition of facilities in the 100-year floodplain both because of the potential impacts of such a standard on new and existing facilities and because of the availability of techniques to protect the facility from the effects of floods. The Agency believes that with proper safeguards and careful design, hazardous waste management facilities can be located acceptably in the 100-year floodplain.

FIA's minimum requirements (24 C.F.R. §1910.3(c)(3)) for new construction and substantial improvements of any commercial, industrial, or other nonresidential structure in the 100-year floodplain specify that either the lowest floor, including basement, must be elevated to the level of the 100-year flood elevation; or, together with attendant utility and sanitary facilities, must: (1) be floodproofed so that below the 100-year flood level the structure is watertight with walls substantially impermeable to the passage of water; and (2) have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.[73]

EPA believes that FIA's requirements are reasonable and that the general principles could be applied to operational units of a hazardous waste facility. Owners or operators who can show compliance with the FIA requirements should have no difficulty obtaining a RCRA permit, unless circumstances of waste type, location, and/or design lead the Regional Administrator to a decision that an unacceptable risk may still exist. EPA is leaving the regulation of structures that are not used directly to manage hazardous waste (e.g., offices, sanitary facilities) up to local authorities. Undoubtedly these structures will have to conform to similar standards, especially if the facility is located in a community that is in the NFIP.

The Army Corps of Engineers has specified the use of dikes, covers, and flood walls to keep flood waters away from facilities. They have issued technical manuals on designed construction techniques and methods for ascertaining the proper levels of structural integrity for these retaining devices.[74] Similarly the Nuclear Regulatory Commission has thoroughly researched how one protects elements of a nuclear facility from the hazards of flooding. Thus, there is considerable practicable experience with issues of appropriate flood prevention techniques.[75]

Professionally trained engineers should be versed in principles of hydrodynamics and hydrostatics. These areas of study are part of the educational curriculum at engineering school. Because of the education and practical experience of engineers, EPA concludes that a 100-year flood standard would not require novel engineering solutions. The state of the art is sufficient to satisfy most engineering requirements.[76]

Based on inquiries with engineering professors and professional engineers[77] it appears that hazardous waste facilities can be divided into two groups with respect to methods which can be used to prevent washout of waste, i.e., those which require flood protection (not allowing flood waters to reach the facility or active portions thereof) and those which require flood proofing (allowing flood waters to come into contact with structures but preventing damage to them). Facilities within the group which require flood protection are landfills, surface impoundments, land treatment, and waste piles. The most common method of flood protection is the construction of levees around the facility. The general rule for the height of the levee is that is should be the elevation of the flood which it is designed for plus a safety factor of 3 feet. The Army Corps of Engineers has prepared an Engineer Manual (EM 1110-2-1913) for Design and Construction of Levees. It is important for levees to be designed properly; for example, placing the levee material on the ground surface without clearing and grubbing could eventually result in voids being formed where humas has decomposed. Internal drainage networks result which undermine the structural integrity of the levee. Structural components of facilities such as tanks, containers, incinerators, and structures utilized in thermal, chemical, physical, and biological treatment can be flood proofed. Of course, flood protection measures also may be needed at these facilities if waste is exposed at the 100-year flood level; for example, in an uncovered tank. The Corps of Engineers has produced a general manual entitled, "Flood-Proofing Regulations" which will be of use to owners or operators and permitting officials.

The Agency believes that it may be possible for some owners or operators to institute management procedures instead of design provisions, which can adequately safeguard against washout of wastes. A provision has therefore been included which allows owners or operators to demonstrate as part of the permit application that they can safely remove the waste before the area is flooded and store the wastes in a permitted facility that is not vulnerable to flood waters. For example, this might be done by keying waste removal procedures to a certain river stage. When the river approaches flood stage, the drums can be loaded on trucks and moved. The owner or operator will have to demonstrate that procedures are in effect and equipment is available at all times to accomplish removal in a short period of time.

The final standard specifies the same operational and design standards for new and existing facilities. EPA believes that existing facilities pose an equal hazard to human health and the environment when located in the 100-year floodplain. However, in order to decrease the impact of these standards on existing facilities, and to avoid disruption of the waste management system in the Region, existing facilities may be given a reasonable period of time to comply with the standard by means of a compliance schedule that is part of their RCRA permit.

d. Definitions

The term "flood" is difficult to define. "Perhaps it is enough to say that a condition of flood exists when the discharge of a river cannot be accommodated within the margins of its normal channel, so that the water spreads over adjoining ground upon which crops or forests are able to flourish."[78] In the final rule, EPA is defining the "100-year flood" as a flood which has a one percent chance of being equalled or exceeded in any given year. This includes the smaller size but more frequent floods (e.g., 50- and 20-year floods) and excludes the larger but less frequent flood (e.g., 500-year flood). The height of the 100-year flood is called the 100-year flood elevation. It is a statistical concept; over a significantly long period of time, one would expect this flood elevation to be equalled or exceeded once in 100 years. However, it is recognized that in any given 100-year interval, the 100-year flood may not occur, or more than one such flood may occur. The land flooded by this size flood is termed the "100-year floodplain".

e. EPA policy and Executive Order 11988

In the proposed rule, EPA cited Executive Order 11988 as the authority for prohibiting facilities from locating in the 500-year floodplain (unless the demonstration in the "Note" was made). Executive Order 11988 differs from the wetlands Executive Order in that it "applies to federal agencies authorizing private work in floodplains, as well as to federal activities and funding and work on federal floodplain land".[79] EPA policy essentially reiterates the purpose of E.O. 11988 which is to avoid wherever possible the long and short term impacts associated with the occupancy and modification of floodplains. However, given the shortage of hazardous waste facilities, the fact that many industrial on-site facilities are located within 100-year floodplains, and the availability of flood prevention technologies, the standard does not require an analysis of practicable alternatives.

f. The guidance/permitting manual

A guidance/permitting manual that has been prepared to accompany the Location standards provides information as to where FIA flood maps can be reviewed or copies obtained. Other sources of floodplain maps are listed such as the U.S. Geological Survey and the U.S. Army Corps of Engineers. If a facility owner or operator disputes a floodplain boundary or elevation that was previously determined, procedures will be identified for an owner or operator to follow in order to resolve the disparity.

Steps will also be outlined that an owner or operator or a hydrologist can follow to determine the 100-year flood flow and then, the 100-year flood elevation.

Examples of how to prevent washout will be provided and technical design and construction manuals for use in this regard will be listed.

5. Summary of the floodplain regulation (§264.18(b))

Hazardous waste facilities that are located within the 100-year floodplain must be designed, constructed, operated and maintained so as to prevent washout of any hazardous waste by a 100-year flood. This requirement can be waived if the owner or operator either demonstrates that emergency procedures initiated at the facility would result in the safe removal and storage of the waste before flood waters reach the facility. Existing facilities must be in compliance with this standard within a reasonable period of time from the date that a RCRA permit is issued.

The following terms are defined in the standard:

"100-year flood" means a flood that has a one percent chance of being equalled or exceeded in any given year.

"100-year floodplain" means any land area which is subject to a one percent or greater chance of flooding in any given year from any source.

"Washout" means the movement of hazardous waste from the active portion of the facility as a result of flooding.

E. Wetlands

1. Summary of proposed standard (§250.43-1(e))

The proposed standard prohibited hazardous waste facilities from locating in a wetland. An owner or operator of a facility could obtain a discretionary approval for locating a facility in wetlands if the facility was operated under a NPDES permit, and if dredging or filling of a wetland was associated with the facility, that he obtained a permit under Section 404 of the Clean Water Act (P.L. 95-217).

In proposed §250.41(b)(100), "Wetlands" were defined as,

> "those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do or would support, a prevalence of vegetation typically adapted for life in saturated or seasonally saturated soil conditions."

Swamps, marshes, bogs, sloughs, potholes, wet meadows, river outflows, mudflats, and natural ponds were cited as examples of environments that would be classified as "wetlands".

2. Rationale for the proposed standard

The nation's coastal and inland wetlands are vital natural resources of great hydrological, ecological, economic, and social importance. Wetlands provide natural flood and storm control, sediment and erosion control, recharge of aquifers, natural purification of waters, and flow stabilization of streams and rivers.

Wetlands produce large quantities of nutrients which support complex ecosystems extending into estuaries and streams, well beyond the marshes and wetland areas. Wetland habitats support fish, shellfish, mammals, waterfowl, and other wildlife fauna and flora. Moreover, wetlands are used in the production of many agricultural products (food and fiber) and timber, as well as for recreational, scientific, and cultural pursuits.[80]

The alteration and destruction of the wetland resource through draining, dredging, filling and other means has had an adverse cumulative impact on wetlands and other aquatic resources. Recent estimates indicate that between 30 and 40 percent of the 127 million acres of original wetlands in the lower 48 states have been irrevocably destroyed.[81] The intent of the proposed standard was to minimize the potential adverse effects on wetlands that may be associated with hazardous waste facilities.

One objective of the Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity" of the waters of the United States (Section 101). Because some wetlands are part of the waters of the United States, EPA and the Corps of Engineers have promulgated regulations to protect these wetlands from the adverse impacts of discharges of pollutants, and dredged or fill material.

Section 402 regulations require that a NPDES permit be obtained for the point source discharge of pollutants into waters of the United States. Since hazardous wastes are pollutants, as defined by the CWA (Sec. 502(6)), the discharge of hazardous waste from a point source into wetlands requires a NPDES permit.

Section 404 regulations require the Army Corps of Engineers to issue permits pursuant to criteria issued by EPA for the discharge of dredged or fill material into waters of the United States. The primary protection sought under Section 404 is a consideration of the effects upon the wetland environment from the construction and continued presence of a facility in a wetland.

3. Response to Comments

a. The definition of wetlands

C: i. EPA should use the definition of wetlands -

(1) in E.O. 11990 because the same meaning was intended and E.O. 11990 is cited as the authority for wetland protection.

(2) that is used by the COE, as well as their method of designating value to wetlands developed pursuant to §404(b) of the Clean Water Act.

(3) used by the Department of Interior as well as their system for classifying wetlands.

ii. Wetlands should be defined as: "those areas which are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life and are capable of tolerating life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and other periodically inundated or saturated areas, such as sloughs, prairie potholes, wet meadows, river overflow and river backwater areas, mud flats, and natural ponds. This term should be broadly construed to include those areas which in fact perform the wetland values described in 40 C.F.R. §230.4-1(a)(1)(i) to (vi)."

R: EPA's authority under RCRA is sufficient to justify promulgating standards to protect wetlands. Therefore, EPA does not rely on the Executive Order's authority, but does cite it as reflecting federal concern for preserving our wetlands.

EPA believes that definitions should be consistent to the greatest degree possible between Federal agencies and particularly within EPA itself. The definition of wetlands in Part 122 (45 FR 33424, May 19, 1980) is identical to the definition used by the Corps and EPA in implemeting Section 404.

It is also the same definition used by the §4004 (RCRA) program, and it is substantively the same as the definition in E.O. 11990. It would be counter productive to unilaterally modify the definition of wetlands. Therefore, when EPA promulgates a location standard for wetlands, in all likelihood the definition of wetlands in Part 122 will be employed.

The Department of Interior's definition and wetlands classification system may be a good system for future use. At this time however, data are still being gathered and many areas have not been mapped. When the inventory is complete, it should facilitate the management of wetlands and deepwater habitats on a sound, multiple-use basis.[82] DOI anticipates that all Federal agencies will adopt its classification system and maps when the inventory is complete.

C: Maps which correspond with the proposed definition of "wetlands" are not available. Identifying the boundaries of wetland areas places a difficult burden on industry which could cause a delay in the approval of hundreds of disposal facilities.

R: Since RCRA at present will rely on the Section 404 permitting program, there is no added burden on the applicant for he must determine, irrespective of RCRA, whether the site is in a wetland for Section

404 purposes. This being the case, the owner or operator of a facility would contact the appropriate District Office of the Corps of Engineers for assistance in determining whether the site is in a wetland.

C: The proposed definition of "wetlands" is sweeping, and as such, it would include substantial land areas - almost the entire states of Florida and Louisiana - making it difficult to site disposal facilities in these and other states.

R: The definition of wetlands used by EPA and the Corps in the Section 404 program does not contain the phrase "or would support" that was used in the proposed definition of wetlands. Thus the Section 404 program's definition is more precise than the proposed definition.

C: EPA should not consider all wetlands to be alike:

- there are significant differences in the ecological value of various types of wetlands (e.g., freshwater and estuarine*); different

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* The commenter stated that freshwater wetlands are able to receive large volumes of nutrient-laden water because the water is dispersed over a large area, and the plant life is adapted to filtering nutrients from the water. However, inhabitants of estuarine-type wetlands must already cope with widely varying salinities. When organic and industrial waste is discharged into these wetlands, an additional stress is realized: bioaccumulation of toxic substances. The discharge may go downstream with the ebb tide; however, it returns with the natural flowage.

404 purposes. This being the case, the owner or operator of a facility would contact the appropriate District Office of the Corps of Engineers for assistance in determining whether the site is in a wetland.

C: The proposed definition of "wetlands" is sweeping, and as such, it would include substantial land areas - almost the entire states of Florida and Louisiana - making it difficult to site disposal facilities in these and other states.

R: The definition of wetlands used by EPA and the Corps in the Section 404 program does not contain the phrase "or would support" that was used in the proposed definition of wetlands. Thus the Section 404 program's definition is more precise than the proposed definition.

C: EPA should not consider all wetlands to be alike:

- there are significant differences in the ecological value of various types of wetlands (e.g., freshwater and estuarine*); different types of wetlands should be defined separately in the regulations and these differences should be reflected in the siting criteria.

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* The commenter stated that freshwater wetlands are able to receive large volumes of nutrient-laden water because the water is dispersed over a large area, and the plant life is adapted to filtering nutrients from the water. However, inhabitants of estuarine-type wetlands must already cope with widely varying salinities. When organic and industrial waste is discharged into these wetlands, an additional stress is realized: bioaccumulation of toxic substances. The discharge may go downstream with the ebb tide; however, it returns with the natural flowage.

- wetlands which contribute little toward wildlife protection or as a nutrient source may be more valuable as disposal sites if they are near communities. In light of the pending shortage of suitable land for disposal purposes the value of a wetland, and hence its suitability as a disposal site, should be determined by the permit writer on a case-by-case basis.

R: In determinations made under Section 404, the ecological value of wetlands is considered. In cases where the Section 404 permitting process has been completed. EPA believes that the value of a particular wetland has been carefully considered.

The RCRA program of EPA is concerned about wetlands which are not part of "waters of the United States" and therefore not subject to CWA jurisdiction. EPA is deferring specific regulation of siting in wetlands until the exact scope of the CWA is determined and other related problems are solved.

EPA cannot make sweeping judgements about the values of one type of wetland over another. Until proven otherwise, all wetlands are assumed to be valuable and worth preserving.

b. The "NOTE" to the proposed standard; NPDES and §404 permits

C: Because the location of a facility in a wetland would bring about the ruin of the wetland, the note is at variance with the purpose for which the standard was written (i.e., the protection of wetlands), and therefore should be deleted. However, because the removal of a small wetland may not endanger or interfere with wildlife, an owner or operator of a facility should be able to remove a wetland if the wetland: (1) is no larger than 1/2 acre discrete and distant from other such wetlands; (2) does not play a significant role in life history stages of migratory and resident wildlife; and (3) is not part of or recharge to an underground drinking water source.

R: The commenter's approach of allowing facilities to locate in wetlands if the wetland exhibits certain characteristics is broadly included in the Section 404 evaluation procedures. However, the 404 program goes farther in that it considers alternate locations and how a facility could be built to minimize damage to the wetland. The latter two factors that the commenter suggested are considered by the Corps and EPA in evaluating §404 permit applications. The first factor is not considered in and of itself, but rather only in so far as the size of a wetland affects the wetland's productivity, habitat value, water purifying capability, or any of the other factors evaluated by the Corps and EPA.

C: There is no reason to prohibit location of a facility in a wetland if the owner or operator can demonstrate:

- that there will be no harm to human health and the environment and that applicable Federal requirements for the protection of wetlands will be met.
- compliance with the proposed Human health and environmental standards.
- that there will be no discharges to the wetland (this additional variance provision would make it possible for storage facilities to locate in a wetland).

R: EPA has not scoped out its final approach to siting hazardous waste facilities in wetlands. However, human health and the environment are protected to some degree by other regulations now in existence. Environmental and human health concerns are considered in the Section 404 permitting procedures and NPDES effluent limitations and the RCRA facility standards.

The proposed human health and environmental standards are largely redundant requirements for compliance with regulations under other statutes that a facility is required to comply with independently. The exception is the proposed groundwater human health and environmental standard which is now expressed in the groundwater monitoring regulations and the facility standards.

In response to the last comment, it would not be appropriate to allow location in a wetland solely on the condition that there would be no discharge of hazardous waste to the wetland. Wetlands are not good building sites in their natural state and therefore must be modified to some degree before the facility is constructed. This modification in and of itself may destroy acres of wetlands. Of course, discharges to wetlands are not permissable unless they are in accordance with applicable federal (e.g., NPDES), state, and local permits.

C: The only condition under which a facility should be allowed to locate in a wetland is if the facility design assures proper protection of the wetland. If this condition is met, the appropriate NPDES and dredge and fill permit should be issued.

R: Facility design may ensure "proper protection" of a wetland after the facility is constructed in a wetland however, such a standard would have limited utility as a location standard. Furthermore, NPDES and dredge and fill permits are only required for discharges to wetlands.

C: A permit under RCRA should not be limited by requirements for a permit under the NPDES or the Section 404 programs because there will be facilities which are not subject to either of these programs, and thus, no basis would exist for a permit under RCRA even where impacts of locating a facility in a wetland would be minimal. Furthermore, the RCRA, NPDES, and 404 programs are concerned with three different problem areas and the creation of interlocking authority may result in confusion rather than serve the public interest.

R: At present EPA and the U.S. Army Corps of Engineers (COE) have not come to an agreement on the appropriate scope of the definition of "fill material" in regulations promulgated pursuant to the Clean Water Act. Until this is resolved, the exact set of circumstances under which the owner or operator of a hazardous waste facility would be required to obtain NPDES or §404 permits is not known. When the scopes of these CWA programs are sorted out, EPA intends to fill the gaps in protection of human health and the environment where they exist in relation to hazardous waste facilities. In doing this, EPA will consider determinations made under the NPDES and Section 404 programs so that duplication will be minimized.

C: By requiring a facility to obtain a NPDES permit, EPA is not solving the problem; it is "passing the buck" by forcing facilities to submit to CWA jurisdiction.

R: As stated before, it was improper for EPA to require a NPDES permit for locating in wetlands. Such requirements has been deleted.

C: The requirement for a NPDES permit in the proposed "NOTE" should be deleted because:

- if the facility has a point source discharge into navigable waters, then a permit is already required under FWPCA, such that the requirement for a NPDES permit under RCRA is redundant.
- if the facility has no point source discharge, then the proposed RCRA requirement is unauthorized and invalid.
- the NPDES program has no provisions for transportation-related discharges to wetlands.
- the deposition of solids into a wetland facility does not constitute a point source discharge to navigable waters.
- even though the purpose of the discharge may be waste disposal, solid waste discharges into navigable waters are generally more subject to the 404 program than the NPDES program; this interpretation is consistent

with Congressional intent since discharges causing material hydrologic modification clearly constitute "fill material" within the meaning of Section 404.

- Congress directed EPA to issue environmental guidelines to govern disposal sites (§404(b)(i)) and to prohibit disposal at a site upon determining that the discharge would have an unacceptable adverse effect on the environment (§404(c)). These responsibilities would be redundant if dual permits under §§402 and 404 were required. Such redundancy would conflict with the national policy of §101(f) that EPA "prevent needless duplication and unnecessary delays" in its implementation of the Clean Water Act. The control of disposal in wetlands should only be under regulations promulgated in accordance with Section 404 of the Clean Water Act.

R: EPA agrees that NPDES permits are independently required under the CWA for discharges of pollutants from a point source into waters of the U.S. EPA's intent in the proposed standard was to allow a facility to locate in a wetland if the owner or operator had independently obtained a NPDES permit under §402 of the CWA.

NPDES permits are issued for point sources such as a truck delivering trash to a wetland. Therefore, the commenter was incorrect in stating that the NPDES programs has no provisions for transportation-related discharges to wetlands.

The subject matter of the remainder of these comments was discharges to wetlands. Discharges to wetlands are regulated under the CWA. As was stated previously, the scope of the CWA programs needs to be decided upon before EPA can determine what its role for protecting wetlands under RCRA should be.

c. Executive Order 11990 - Protection of Wetlands

C: The Executive Order does not give EPA the authority to prohibit construction of hazardous waste disposal sites in wetlands because:

- Section I(b) of Executive Order 11990 states that the Executive Order does not apply to the issuance by Federal agencies of permits for activities involving wetlands on non-Federal property.
- The Executive Order does not flatly ban construction in wetlands, but provides that it may be allowed where, based on economic, environmental, and other pertinent factors, there is no practicable alternative to such construction, and that the proposed action

includes all practicable measures to minimize harm to wetlands which may result from such use. EPA should also adopt this approach as the basis for determining whether a permit will be granted to a facility located in a wetland because this will provide adequate and equal protection for both Federal and non-Federal wetlands and at the same time permit the regulatory authority to exercise some discretion.

- Because no EIS was prepared for the Executive Order, nor was any notice published or public hearings held on the Executive Order as mandated by Section 4 of the Administrative Procedures Act. For these reasons, the Executive Order is null and void, and therefore, it has no binding effect upon any Federal agency in developing its regulations, permit issuing procedures, or policies.

R: EPA agrees that Executive Order 11990 does not apply to the issuance of permits to private parties for activities involving wetlands which are located on non-Federal property. However, EPA does not rely on the Executive Order as authority for regulating for wetland conditions. Authority is found in RCRA itself in Section 3004 which grants the Administrator authority to promulgate standards "necessary to protect human health and the environment ... [for] the location, design, and construction of such hazardous waste treatment, disposal or storage facilities." Executive Order 11990 is cited to show the long standing federal interest in protecting wetlands. EPA policy pronouncements of May 1973 and November 1979 similarly state the Agency's vital concern for preserving this natural resource.[83]

EPA has not formulated a comprehensive approach for siting in wetlands at this time.

d. Miscellaneous comments

C: EPA should delete the entire "wetlands" section until the Agency develops a thorough-going program related to the location of facilities and the discharges from such facilities in wetlands.

R: EPA is deferring specific regulation of the siting of hazardous waste facilities in wetlands until the interface between the CWA and RCRA can be determined in this regard.

C: EPA has offered no valid justification for a ban on construction in wetlands.

R: EPA does not ban construction in wetlands.

C: Rules for operation in a wetland should be provided in this standard because careful operating procedures can minimize the potential risk of a wetland discharge site. Operating procedures that were suggested by the commenters are: (1) routine monitoring for leachate in selected areas surrounding the site at approximately monthly intervals; and (2) bimonthly sampling of surface water areas.

R: EPA is not writing regulations for a wetland discharge site in the Location standards. However, operating procedures which are designed to prevent contamination of the area surrounding the facility, regardless of the type of land area it is, are provided in the facility standards. Most pertinent to the commenters' suggestions are the ground-water monitoring requirements. Other operating and design requirements are specified for operational units where leaks to ground water or surface water may not be readily detected (e.g., controls to prevent overfilling of tanks, and liner and impervious base requirements.

C: RCRA regulations should not prohibit disposal in wetlands.

R: The proposed regulation did not prohibit disposal in wetlands.

4. Current status of regulating siting in wetlands

a. Values of wetlands

The federal government has actively sought to protect wetland resources* for we recognize that the nation's coastal and inland wetlands are vital natural resouces of great hydrological, ecological, and social importance. In recent years, the public and lawmakers have also come to realize that wetlands must be preserved in order to maintain an ecologically stable and balanced environment. The protection of wetlands has become a vitally important priority in the effort to restore and maintain water quality and preserve natural hydrologic cycles.[84] Wetlands purify and regenerate water, control flood waters, and provide food and habitat for wildlife. Commercially important fish and shellfish harvested along the Atlantic and Pacific Coasts and in the Gulf of Mexico depend on coastal estuaries and their wetlands for food sources, spawning grounds, and for support of various stages of their life cycles. In addition, wetlands provide essential resting, wintering, and nesting grounds for many species of migratory waterfowl, other waterbirds and songbirds.[85]

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* EPA, in adopting this approach, utilizes the Section 404 definition of wetlands which is:

> "Wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Wetlands are also a valuable tool in floodplain management. Marshes and swamps along coasts, rivers, and lakes protect shorelines and banks from erosion. Wetlands additionally have the capacity to store floodwaters temporarily and in some instances to reduce the volume and severity of floods.[86] For example, the Corps of Engineers concluded after a five year study that flooding problems in the Charles River Basin in Massachusetts could best be resolved by maintaining 8,500 acres of wetlands in their natural state.[87]

More recently, chemists have begun to appreciate the ability of wetlands to buffer aquatic ecosystems from the inroads of pollution. Thus wetlands may prove to be a valuable resource in protecting our water supply from the increasing number of contaminants which enter our environment.[88]

b. Potential damages to wetlands and consequences of damage

EPA is aware that indiscriminate placement of hazardous waste facilities in wetlands is likely to contribute to the degradation of that resource.

Draining or filling in the wetland will probably be required to produce stable foundations for buildings, roads, tanks, etc. Draining and filling not only could destroy the area of the wetland that is drained or filled, but it could also have secondary impacts such as an alteration of water circulation patterns, or a deficit in habitat area or food availability.

Impacts from spills or other emergency incidents would also be more likely to do extensive harm to a wetland and hydrologically connected areas because; (1) wetlands are usually part of a hydrologic cycle which could be connected to drinking water sources and other water bodies, (2) a high water table exists and thus transport of contaminants to ground water and surface water is expedited, and (3) wetlands are fragile ecosystems themselves and therefore cannot absorb external pressures to the degree that other ecosystems can (see 38 FR 10834).

The EPA standard should be preventive rather than corrective. The causal relationship between an action in a wetland area and the diminution of water quality, flooding, or the disappearance of a species of fish is not always readily recognized. Moreover the cumulative impact of excessive encroachments in a wetland might not be apparent in the immediate area of the facility but could manifest itself at lower elevations in a watershed.[89]

c. EPA policy

This policy of protection has taken several forms. EPA as early as May 1973 stated its policy that:

> It shall be the Agency's policy to minimize alterations in the quantity or quality of the natural flow of water that nourishes wetlands and to protect wetlands from adverse dredging or filling practices, solid waste management practices, siltation or the addition of pesticides, salts or toxic materials arising from nonpoint source wastes and through construction activities, and to prevent violation of applicable water quality standards from such environmental insults.

Several years later in 1977, the Administration issued Executive Order 11990 entitled "Protection of Wetlands" which requires Federal agencies to take action to minimize the destruction, loss or degradation of wetlands. While the Order did not apply to permitting activities by its terms, the Order focused federal concern on preservation of the nation's wetlands.

On July 5, 1979 EPA, building upon this Executive Order, reaffirmed its wetland policy in the "Statement of Procedures on Floodplain Management and Wetlands Protection". EPA required that existing regulations and procedures be amended to incorporate the policies and procedures set forth in this Statement. The EPA policy was:

> The Agency shall avoid wherever possible the long and short term impacts associated with the destruction of wetlands and the occupancy and modification of floodplains and wetlands, and avoid direct and indirect support of floodplain and wetlands development wherever there is a practicable alternative.

d. Applicable existing programs and deferral of regulation

In developing a regulatory program as authorized by Section 3004 of RCRA, EPA has sought to achieve consistency with these policies. There are three aspects of facility construction and operation which should be considered for wetland locations. The first is the impact, without regard to the nature of wastes handled by the facility, that the construction and actual presence of the facility will have upon the wetland environment. The second is the impact of planned discharges from the facility and the third is the potential impact of accidental and unplanned discharges of hazardous waste into the wetland environment.

In reviewing the proposed rule and comments on it, EPA considered not promulgating a wetland location standard under RCRA, but rather just ensuring that the permit applicant had obtained permits under the NPDES and Section 404 programs if they were required to do so under the Clean Water Act. EPA previously determined that these existing programs adequately protected wetlands from the adverse impacts of the construction and actual presence of the facility, and adverse impacts from planned discharges from the facility. In the later stages of developing the location standards promulgated today, it became apparent that EPA could not go forth with such an approach for three fundamental problems exist. One, the U.S. Army Corps of Engineers (COE) and EPA had not come to an agreement on the appropriate scope of the definition of "fill material". Until this is resolved, the exact set of circumstances under which the owner or operator of a hazardous waste facility would be required to obtain NPDES or §404 permits is not known. Two, not all wetlands are "waters of the United States" and therefore, they are not under the jurisidiction of the Clean Water Act. EPA could not rely on either the NPDES or the §404 program for these wetlands. The third problem relates to a COE policy of issuing general or nationwide Section 404 permits for some wetlands and certain activities in wetlands, rather than issuing individual §404 permits. These wetlands and activities are permitted by class and each action is not scrutinized individually. EPA believes that the suitability of a wetland for siting of a hazardous waste facility must be determined on a case-by-case basis.

EPA is deferring specific regulation of the siting of facilities in wetlands until it is clear to EPA what the extent of coverage of the NPDES and Section 404 programs will be. EPA expects, however, to retain the presumption against siting facilities in wetlands which was expressed in the proposed rule, and to promulgate standards as necessary to address situations not covered by NPDES and Section 404 programs. EPA will consider determinations made under the NPDES and Section 404 programs so that duplication will be minimized.

EPA believes that in the interim wetlands will be sufficiently protected against the unintentional discharge of hazardous waste through facility compliance with the Part 264 standards. Examples of Part 264 requirements that would protect wetlands in the vicinity of facilities include: maintenance of freeboard at surface impoundments, controls to prevent overfilling of tanks, diversion of run-on and collection of run-off for piles, land treatment facilities, and landfills. Forthcoming regulations to protect ground water and surface water from the adverse effects of land disposal facilities will also protect wetlands. This list is by no means complete.

F. Endangered and Threatened Species and Critical Habitats

1. Summary of the proposed standard (§250.43-1(f))

The proposed standard prohibited hazardous waste facilities from locating in areas where they would be likely to jeopardize the continued existence of endangered and threatened species, or where the facility would destroy or adversely modify their critical habitat. The standard provided for a discretionary approval for location in a critical habitat if the owner or operator consulted with the Office of Endangered Species (U.S. Fish and Wildlife Service, Department of the Interior) prior to demonstrating (at the time a permit is issued) that operations carried out by the facility would not jeopardize the continued existence of endangered and threatened species located within the critical habitat.

Species that are endangered or threatened are listed in 50 CFR Part 17, Section 4 pursuant to the Endangered Species Act of 1973 (P.L. 93205, 16 U.S.C., 1530 et seq.). Critical habitats of endangered and threatened species are listed in 50 CFR Part 17 (1760 et seq.).

2. Rationale for the proposed standard

The Endangered Species Act of 1973 was enacted to conserve the ecosystems and habitats upon which endangered and threatened species depend for their existence and to provide a program for the conservation of such endangered and threatened species (Sec. 2(b)). This was to be accomplished by requiring all Federal agencies, in consultation with the Secretary of the Interior or the Secretary of Commerce, to utilize their authorities in furtherance of the purposes of the Act (Section 7). EPA proposed this standard to insure that owners or operators locate and operate their facilities so as not to (1) jeopardize the continued existence of endangered and threatened species or (2) result in the destruction or adverse modification of the critical habitats of those species.

3. Response to Comments

a. The Endangered Species Act (ESA)

C: The standard is much broader than the ESA (the commenter did not explain why he thought this was so).

R: The proposed regulation language is the same as, with minor modifications that are not substantive, Section 7(a)(2) of the ESA.

C: The standard is unnecessary because the regulated community already knows it has to comply with the ESA. It should not be necessary to incorporate the features of each predecessor law into the regulations of each new law.

R: EPA does not agree that the proposed standard was unnecessary. Although Section 9 of the ESA applies to any person subject to the jurisdiction of the United States, Section 7 specifies EPA's responsibilities under the ESA. The proposed standard reiterated EPA's responsibilities; the content of that standard now appears in Section 122.12 (Part 122 - permitting requirements; see 45 FR 33428, May 19, 1980.)

b. The phrase "to be likely" in the proposed standard

C: The phrase should be deleted because it weakens the standard. If there is any possibility of jeopardizing endangered and threatened species, a facility should not be allowed to locate.

R: EPA disagrees with the commenter's interpretation of the effect of the phrase "to be likely". That phrase was included to strengthen the provision. After an action jeopardizes a species, it may be too late for the species to recover. The "to be likely to jeopardize" language follows the statutory language of the ESA.

C: "To be likely" should be deleted because "jeopardize" itself connotes a subjective determination without the addition of the adverbial modifer, "likely". The "likely" to jeopardize language would facilitate the prohibition of siting of facilities on the sheerest speculation.

R: The phrase "is not likely to jeopardize" is found in Section 7(a)(2) of the ESA. Regulations promulgated by the Departments of the Interior and Commerce under Section 7 have defined "taking" to clarify the actions which would be "likely to jeopardize" an endangered or threatened species. "Taking" is defined as harassing, harming, pursuing, hunting, wounding, killing, trapping, capturing or collecting, or attempting to engage in such conduct. (See 43 FR 873.) "Taking" is also used in Section 9 of the ESA.

c. Protecting endangered species outside of their critical habitats

C: Endangered species should only be protected in their designated critical habitats.

R: EPA disagrees with the commenter. The ESA requires all Federal agencies and any person subject to the jurisdiction of the United States to protect endangered species wherever they occur. Preservation of endangered species would not be accomplished if these species were allowed to be "taken" as soon as they went beyond the boundaries of their designated critical habitats.

d. Locating in a critical habitat; the "NOTE" to the proposed standard

C: The "NOTE" should be deleted because the very location of a facility in a critical habitat would probably jeopardize the continued existence of an endangered species given the documented evidence of damage caused by the treatment and storage of hazardous waste.

R: If a facility is located or is proposed to be located within a critical habitat EPA is required to ensure that such action will not appreciably diminish the likelihood of the survival and recovery of endangered and threatened species. Furthermore, under the ESA, owners or operators are implicitly required to evaluate if the construction, presence, and operation of their facility will result in the taking of endangered or threatened species.

C: The "Note" does not indicate how it is to be demonstrated that facility operations will not jeopardize the continued existence of endangered species. Furthermore, once a permit is issued, there are no means of preventing careless spillage and leakage of deadly chemicals which would result in irreparable damage to endangered and threatened species.

R: If a facility is located or proposes to locate in a critical habitat, EPA will determine, in consultation with the Department of Interior or Commerce, if the facility will appreciably diminish the likelihood of the survival and recovery of endangered and threatened species. A facility that is permitted pursuant to the Part 264 standards presumptively will not cause careless spillage and leakage of waste.

C: A framework for consultation should be set up to ensure that all pertinent and necessary information is supplied to the Department of Interior prior to any decision regarding the location of a facility in a critical habitat.

R: EPA no longer requires that owners or operators consult with the Department of the Interior. The Department of Interior (DOI) is currently writing final regulations for the consultation process mandated by Section 7 of the ESA. This consultation process is only applicable to consultation between Federal agencies and the Secretary of the Interior. The regulations soon to be promulgated by DOI will specify the information that is necessary to present during a consultation.

4. Final disposition

a. Potential damage

Many species of plants, fish, and wildlife have become threatened or endangered or extinct in the past through the cumulative effects of human activities.* Habitat destruction, excessive killing, and contact with an environment which has become, in recent years, increasingly contaminated with a complex array of toxic chemicals are factors which contribute to the demise of these species. Indirect poisoning or debilitation can result from the biological magnification of toxic elements or compounds in the food chain.

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* Endangered species are species which are in danger of extinction throughout all or a significant portion of their range except for species of the Class Insecta determined by the Secretary of Commerce to be a pest whose protection would present an overwhelming and overriding risk to man. Threatened species are species which are likely to become endangered species within the foreseeable future throughout a significant portion of their range. (Section 3, ESA)

Locating, constructing, and operating hazardous waste facilities, if not adequately regulated, can lead to further reductions in populations of endangered and threatened species. Possible impacts include removal of critical habitat,* restricting the movement of species, and degrading the environment near the facility (e.g., increasing siltation of rivers, degrading air quality). Thus, EPA believes that it is important to evaluate effects on endangered and threatened species and their critical habitats when a hazardous waste facility is being located or when an existing facility is applying for a permit.

As of January 31, 1980 there were 228 species listed as endangered and 44 species listed as threatened in the United States.[90] Lists of endangered and threatened species are periodically published in the Federal Register. The last such listing appeared on May 20, 1980 in Volume 45, Number 99 (p. 33768-81) of the Register. Critical habitats are also published in the Federal Register.

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* Critical habitat is the area, together with contained biological and physical elements, which are necessary for the conservation of the species. (For greater detail see Section 3(5)(A) of the ESA.)

b. The Endangered Species Act and Part 122

EPA's authority for protecting endangered and threatened species and their critical habitats is contained in both the ESA and the RCRA. RCRA inherently accounts for protection of endangered and threatened species and their critical habitats by specifying that location standards must be promulgated which protect the environment. Section 2 of the Endangered Species Act of 1973, as amended, specifies that all Federal departments and agencies are to seek to conserve endangered and threatened species and to utilize their authorities in furtherance of the purposes of the ESA. Those purposes include providing a means whereby the critical habitats of endangered and threatened species may be conserved and providing a program for the conservation of endangered and threatened species. Section 7 of the ESA specifies that Federal agencies must take no action which is likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitats of such species unless the agency has been granted an exemption for the action by the Endangered Species Committee (such as the case of the Tellico Dam project in Tennessee).

Part 122 of the Consolidated Permit Regulations (45 FR 33290; May 19, 1980) contains a section (§122.12) which lists Federal laws which EPA is required to comply with. The ESA is listed and EPA's requirements under Section 7 stated. EPA is required to ensure that the facility which it is permitting is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.

Section 9 of the ESA applies to any person subject to the jurisdiction of the United States. Thus, owners or operators are subject to requirements under that Section irrespective of RCRA. Section 9 regulates, among other things, the taking, possession, and transport of such species.

EPA has therefore determined that the Endangered Species Act adequately protects endangered and threatened species and their critical habitats such that a separate requirement in the Location standards is unnecessary.

Owners or operators of facilities should contact the Regional Offices of the U.S. Fish and Wildlife Service (Department of Interior) and State agencies that have responsibility for protected species for current listings of endangered or threatened species and information on the location of critical habitats. A guidance/permitting manual on the Location standards contains a section on compliance with the ESA. Owners or operators and permitting officials should consult this manual for help in determining if the facility has the potential to adversely affect a listed species or a designated critical habitat.

G. Sole Source Aquifers

1. Summary of the proposed standard (§250.43-1(g))

The proposed standard prohibited hazardous waste facilities from locating in the recharge zone of a sole source aquifer. The "Note" to the proposed standard specified that a facility could be allowed to locate in the recharge zone of a sole source aquifer if it could be demonstrated (at the time of permit issuance) that the facility is located, designed, constructed, operated, maintained, and monitored to prevent endangerment of the sole source aquifer.

"Sole source aquifers" were defined in proposed §250.41(b)(82) as,

> "those aquifers designated pursuant to Section 1424(e) of the Safe Drinking Water Act of 1974 (Pub. L. 93-523) which solely or principally supply drinking water to a large percentage of a populated area".

2. Rationale for the proposed standard

Approximately 123 million Americans rely on ground water for drinking purposes. Ground water also supplies 36% of all irrigation water and about 25% of the fresh water used by industries dependent on their own water supply facilities. Six states depend on ground water for more than half of their water needs.[91] Sole source aquifers are unique and highly important natural resources because they are, by definition, the principal source of drinking water for population centers.

Aquifers are replenished through recharge zones which are permeable to rainfall and surface run-off and through which the aquifer is susceptible to contamination. The location of a hazardous waste facility in the recharge zone is undesirable because:

(1) degrading a portion of the recharge zone reduces the amount of uncontaminated water available for use;

(2) the contaminants would be more likely to migrate to adjacent areas of the aquifer, and to surface waters.

The purpose of the proposed regulation was to prohibit the location of facilities in the recharge zone of sole source aquifers. However, the Agency allowed facilities to locate in the recharge zone of a sole source aquifer, at the discretion of the permitting authority, if the owner or operator could demonstrate that such location would not endanger the aquifer.

3. Response to comments

a. The proposed standard is too lenient

Summary of Comments

(i) The safety of all drinking-water-quality aquifers must be assured under RCRA and the SDWA so that the intent of both of these Acts are fulfilled.

(ii) The siting restriction should be expanded to apply to location of facilities:

- in the recharge zone of every underground drinking water source
- in the watershed of a public drinking water supply
- upstream of or in the recharge zone of any aquifer

(iii) The "Note" to the proposed standard should be deleted. In view of the limited number of available drinking water sources, and the potential social, environmental and economic costs that would be involved if an aquifer was polluted "by mistake" (i.e., the degree of protection required was miscalculated), no hazardous waste facility should be permitted in the recharge zone of a sole source aquifer. EPA should not opt for the short-term accommodation of conditionally allowing hazardous waste facilities to locate in the recharge zone of sole source aquifers when the long term water supply of our nation is at stake.

(iv) There should be no condition under which a facility could be located in the recharge zone of a sole source aquifer unless positive assurances are provided to prevent groundwater pollution.

(v) The standard does not provide much protection for states where a sole source aquifer has not been designated.

(vi) No hazardous waste facility should be sited near the zone of "important aquifers" because of:

- the uncertainties surrounding the effectiveness of the design and management criteria required by EPA in Section 3004;
- the weaknesses of the endangerment concept and the proposed human health and environmental standards; and
- the possibility of spills, other accidents or human error.

To more precisely regulate where, in relation to aquifers, a facility would/would not be allowed to locate, the commenter suggested that EPA establish three categories of aquifers and classify every known aquifer accordingly. The three categories and their attendant siting specifications follow.

- No facility should be allowed in the recharge zone of a priority aquifer unless the permit applicant can show that no alternate site exists within a multi-state area. This category includes all aquifers which,
  - meet the criteria for sole or principal sources contained in the proposed 40 CFR §148 (42 FR 51620)

  - discharge into wetlands or high quality surface waters
  - are high quality present or potential drinking water sources
  - are so designated by a §208 agency under the Clean Water Act or the §4002 planning process of RCRA
  - have less than 10,000 ppm total dissolved solids

- Facilities should be allowed to locate over the recharge zone of other underground drinking water sources (UDWS) if the facility complies with all of the §3004 criteria. To be included in this category are aquifers which, although they may be actual or potential drinking water sources, warrant less protection because of either existing contamination, availability of other drinking water sources, or the absence of significant surface water effects.
- Facilities should be encouraged to locate over underground non-drinking water sources. This category includes aquifers which are saline, highly polluted or otherwise of severely limited value. Facilities located over these facilities will still have to comply with all §3004 regulations.

When classifying an aquifer, EPA should additionally consider the number of people who depend, or will depend, on the aquifer.

Response

EPA agrees that the proposed standard was too restrictive in the universe of aquifers that it protected. The RCRA program is aimed at not allowing contamination of any water that may be used. This includes ground water and surface water that is used, or may be used in the future for drinking water, agriculture, irrigation, or industrial purposes. The specific facility standards provide significant ground water protection.

It would not be practicable for EPA to restrict location in the recharge zones of all UDWS's because a majority of the United States would be included in such a restriction. Additionaly, EPA believes that it would be inappropriate for this Agency to classify all aquifers in the U.S. EPA believes that such a classification scheme should be left up to the States.

b. The standard is too stringent

Summary of Comments

(i) The standard should only apply to land treatment, land storage, and land disposal facilities because these facilities are the only facilities that present any substantial threat to aquifers. The proposed standard will result in numerous unnecessary demonstrations of facility adequacy.

(ii) The "NOTE" to the standard should be amended so that facilities are allowed to locate in the recharge zone of a sole source aquifer provided that measures are taken to prevent endangerment of the aquifer at distances greater than 500 feet from the facility and so that existing water wells within 500 feet of the facility are not endangered. This revision would increase the number of available disposal sites and is in agreement with the purpose of RCRA and the SDWA.

Response

EPA agrees that land disposal facilities pose more of a threat to ground water than other facility types. Because of this, the Phase II land disposal regulations are keyed to protecting groundwater from contamination by hazardous waste facilities. EPA believes that because the facility standards are designed to provide maximum protection to ground water from contamination that a location standard to protect aquifers would be redundant.

c. Miscellaneous comments

(i) The Safe Drinking Water Act (SDWA) applies to facilities which present a "significant hazard to public health". Until such time that a SDWA standard is defined for all activities that take place in the recharge zone of a sole source aquifer, there should not be a special standard for hazardous waste management facilities. The commenter also objected to the RCRA standard being more stringent than the "SDWA standard".

(ii) Because all components of a facility (e.g., tanks, incinerators, storage areas) are potential threats to an aquifer, each component should be required to have berms to control spill and precipitation run-off.

(iii) The recharge zone of an aquifer does not necessarily remain constant over time. Hydrologic changes could cause the recharge zone to expand thereby circumscribing a facility which was previously outside the recharge zone. Such a facility would de facto be in violation of the standard.

(iv) The standard is unnecessary because sole source aquifers are protected under the SDWA.

(v) Retain the proposed siting restriction.

Response

There are no plans to write regulations under the Safe Drinking Water Act for all activities in recharge zones of sole source aquifers. Restrictions in these zones under the SDWA only apply to new underground injection wells.

Requirements for control of spill and precipitation run-off are examples of facility standards which serve to protect ground water. A summary of some of these standards follows in the discussion of the protection provided to ground water by the facility standards. EPA does not however, require spill and run-off control for all components of a facility; rather, only where EPA believes that a potential hazard exists from spills or run-off.

4. Rationale for deletion of the proposed standard

EPA has decided not to promulgate a final location standard concerning recharge zones of sole source aquifers. This decision is based upon (1) the protection that the facility standards will provide to all underground drinking water sources (UDWS) and (2) weaknesses discovered in using the group of aquifers that have been designated as sole source as the subject of a location standard for hazardous waste facilities.

a. Protection provided by facility standards

Taken together, the Phase I and Phase II Part 264 and 265 standards provide for a comprehensive system of waste management which is designed, among other things, to minimize, if not prevent, any contaminant from reaching any point of ground water use. This approach applies equal protection to water that is used for drinking, irrigation, agriculture, and industry. Most of the Part 264 and 265 regulations directly or indirectly protect groundwater such that an exhaustive review would be too lengthy to include here. Examples of standards which protect groundwater follow:

- Waste piles. Run-on must be diverted away from a waste pile. Piles which are used to treat or store waste must be equipped with a containment system to include a leachate and run-off collection and control system and a base. The containment system must be designed, constructed, maintained, and operated to prevent discharge into the land, surface water, or ground water during the life of the waste pile.
- Tanks. At the time of permit application the Regional Administrator will assess the adequacy of the tank design, including the foundation, structural support, seams, and pressure controls. Owners or operators are required to inspect their tanks in order to detect cracks, leaks, corrosion or erosion which may lead to cracks or leaks, or wall thinning.

- Surface impoundments. Surface impoundments used to treat or store waste must be designed to prevent discharge into the land and ground water, and to surface water during the life of the impoundment by use of a containment system.
- Areas that are used for storage of containers must have a containment system that is capable of collecting and holding spills, leaks, and precipitation.
- Leaks are minimized by the inspection standards. Requirements include inspection of areas where containers are stored; containment systems; construction materials of a tank, and emptying the tank for a thorough examination of the condition of the inside of the tank when necessary to detect corrosion or erosion of the tank sides and bottom.
- The standards for management of ignitable, reactive, and incompatible wastes will minimize discharges of waste resulting from violent reactions or corrosion of containment systems.
- EPA intends to promulgate land disposal regulations which provide maximum protection to surface water and ground water.

Given that land disposal facilities are most likely to be the cause of groundwater pollution, the land disposal regulations are key to EPA's belief that all water sources will be protected by the facility standards. The groundwater monitoring requirements provide for early detection of ground water contamination.

b. Inappropriate use of the sole source aquifer designation

While protecting sole source aquifers by restricting location of hazardous waste facilities appears to be a reasonable approach to preserving a portion of the water supply of the nation, a closer look at the criteria which are used to designate a sole source aquifer and future consequences of such designation provide insight into the problems associated with that approach.

One of the criteria for designating a sole source aquifer is that the aquifer must provide over 50 percent of the drinking water for an area. Water sources protected by the hazardous waste program are not limited by present use or the size of the dependent population. An aquifer may not be deemed important enough to warrant designation as a sole source aquifer until a large population has settled in an area for which the aquifer supplies drinking water. It would not show foresight if a hazardous waste facility siting restriction were only to apply when the aquifer was actually designated. In contrast, the facility standards and the groundwater monitoring requirements seek to protect all present and potential water sources.

Another potential consequence of using the recharge zone of sole source aquifers as a siting standard is that an interested group might try to have an aquifer designated as sole source in order to make it more difficult to site a hazardous waste facility in that area. A reduction in hazardous waste management capacity could result due to successful sole source designations, and the increasing number of obstacles to siting facilities. It would also represent improper use of the system under the SDWA to designate aquifers as sole source.

H. Buffer Zone

1. Summary of the proposed standard (§250.43-1(h))

The proposed standard required that active portions of hazardous waste facilities be located at a minimum of 60 meters (200 feet) from the facility property line. A variance to the proposed standard was provided in the form of a "Note". Lesser distances would be allowed if it could be demonstrated that unexpected releases or discharges of hazardous waste could be controlled before they crossed the facility property boundary.

2. Rationale for the proposed standard

A distance between the active portion and the property line of a facility provides a buffer area between the active portion of a facility and the area beyond the periphery of the facility. The Agency believed that a buffer zone would reduce risks to human health and the environment in the vicinity of the facility by allowing unexpected discharges resulting from acute incidents such as fires, explosions, and spills, and chronic incidents such as underground leaks, to dissipate, dilute, or be brought under control before going beyond the facility's property line.

A buffer zone could be of aesthetic value by concealing a facility that otherwise might be an eyesore. In addition, buffer zones might minimize the level of noise and reduce the strength of odors which reach areas beyond the facility.

The selection of a 200 foot buffer zone was based on the State of Oklahoma's Rules and Regulations for Industrial Waste Management.[92] Oklahoma prohibits ultimate disposition of industrial waste within 200 feet of the permit boundary, thus providing a precedent for the proposed regulation. Although other states require buffer zones of narrower width (e.g., Wisconsin - 20 feet, New York 50 feet; and Pennsylvania - 25 feet), these regulations only pertain to municipal solid waste. Since hazardous waste poses a greater risk to human health and the environment than municipal solid waste, Oklahoma's more stringent regulation for industrial waste was adopted. A specific numerical distance was specified in order to facilitate enforcement and to provide a tangible point of reference.

3. Response to comments

These comments are responded to in a general way because the proposed standard has been deleted.

a. Impact on existing facilities

(i) Establishing a 200 foot buffer zone will place an undue hardship on existing facilities where:

- The site is completely built upon such that either part of the facility will have to be dug up and relocated, or additional land will have to be purchased.
- Additional land is not available because the land surrounding the facility is

already occupied by another party.

- The facility will have to bear the cost of digging up and relocating the waste (e.g., as in a surface impoundment) and possibly threatening human safety in the process.

(ii) The impact on existing on-site facilities would be costly and it would render otherwise suitable land unnecessarily useless. In addition, relocation within a plant or industrial area may be difficult or impossible if additional land is not available. These impacts are not balanced by meaningful environmental benefits due to the nature of the site and the adjacent property.

(iii) Existing facilities should be exempt from the proposed standard if:

- The site is bounded by uninhabited or industrialized areas.
- The facility owner or operator can demonstrate that there is minimal danger from operating closer than 200 feet from the property boundary line.

(iv) Existing impoundments should be exempt from the buffer zone requirement because in many cases impoundments are located immediately adjacent to the plant property line and construction of a buffer zone would be costly and might jeopardize the structural integrity of the impoundment due to the limited working space between it and the property line.

(v) The degree of hazard of contained waste should be taken into consideration when specifying the width of a buffer zone for existing lagoons that are located less than 200 feet from a river or a highway.

(vi) The standard is overly stringent for existing facilities where the waste being managed is of a minor hazard.

(vii) This standard could significantly reduce the usable area of existing facilities.

(viii) If existing facilities in areas where space is at a premium or unavailable (e.g., chlor-alkali plants in heavily industrialized areas of the Northeast) were made to comply with this standard, they would experience a competitive disadvantage.

(ix) A facility that is located on property 400 feet wide by 400 feet long or smaller, would be forbidden to treat, store or dispose of hazardous waste because of the 200 foot buffer zone requirement.

Response

EPA agrees that requiring existing facilities to institute a 200 feet buffer zone would be unnecessarily burdensome. The protection provided to human health and the environment would not be congruent with the expense which would be required in most cases. In fact, it could be detrimental to human health and the environment if existing facilities were made to close for noncompliance with the buffer zone standard. EPA additionally agrees that requiring 200 feet at every facility is too inflexible.

b. Surrounding land use

(i) The standard should allow a buffer zone less than 200 feet where no residences are closer than 50 feet from the property line. Facilities located in a remote area or in an industrialized area do not need a large buffer zone.

(ii) Hazardous waste disposal facilities should not be located within 1 mile of residentially zoned land areas because odors can be a problem when weather conditions are favorable and, to protect the welfare and health of people in adjacent residential zones.

(iii) The terrain and the type of neighbors (i.e., residential or industrial) surrounding a hazardous waste disposal site should be taken into consideration when determining the required length of the buffer zone.

(iv) This requirement should be a permit condition so that surrounding land use and facility operation can be taken into consideration by the regulatory authority.

(v) EPA should clarify its position on the location of disposal sites relative to population centers.

(vi) Facilities should not be located in population centers because:

- Explosions may expose thousands of people to toxic airborne substances.
- Leachate from chemical landfills may travel more than 200 feet in porous soil and contaminate public or private wells.

(vii) A minimum buffer zone of 50 feet should be required from the active portion of all facilities to public and private wells.

(viii) A minimum buffer zone should be required from the active portion of all facilities to lakes, streams, rivers, occupied dwellings, highways, public parks, and historical sites.

Response

EPA agrees that it is preferable to locate hazardous waste facilities away from residential areas and population centers. However, EPA believes that equal protection should be provided at a facility regardless of the surrounding land use.

c. Comments specific to facility type

(i) Storage facilities.

- This standard is excessive for small storage facilities (i.e., facilities that store only a few barrels of waste) and for generators in urban areas that store hazardous waste.
- A buffer zone should only be one among many engineering parameters to take into consideration when designing a storage facility.

(ii) Treatment and storage facilities

- A buffer zone is unnecessary due to the diking, surface water diversion, and containment requirements for these facilities that are specified in other sections of the proposed rules.

(iii) Treatment facilities:

- The standard is oppressive and costly due to the difficulty associated with acquiring land in an industrial area.
- EPA should be aware of, and consistent with, local zoning ordinances and industry standards that restrict the placement of

treatment facilities relative to property lines.

- A lesser buffer zone would be appropriate for a treatment facility which converts toxic and hazardous waste to inert material for use in saleable products.
- It is inappropriate for EPA to dictate specific distances, particularly for treatment facilities.
- The size of the buffer zone should be sufficient to provide adequate space and time to detect and correct any ground or surface water contamination and, adequate distance to protect the health of area residents.

(iv) Land disposal facilities:

- A minimum of 200 feet should be required around a land disposal facility.
- 200 feet is appropriate for landfills.
- A 50 foot buffer zone would be adequate for landfarms in light of the prohibition of ignitable and volatile waste from landfarms.
- A 200 foot buffer zone is inadequate and arbitrary for landfills, landfarms, basins, and surface impoundments because of the threat posed by airborne contaminants

and the trackout of toxic substances by vehicles (discussed in the Phase I Background Document on Landfills).

(v) The standard is excessive for vessel cleaning facilities because after the residue in the vessel is diluted with water, its degree of hazard is not commensurate with a 200 foot boundary zone.

(vi) Facilities which handle phosphate related wastes should be exempt from this standard because of the low hazard of these wastes.

(vii) Waste oil recycling facilities should be exempt from the standard because adequate safe guards against accidental spills or discharges are already controlled under Section 311 of the Spill Prevention, Control, and Countermeasure (SPCC) Plan of the Clean Water Act.

(viii) Because used oil is generated in urban areas, used oil reprocessing facilities are more conveniently and economically operated in, or adjacent to, urban areas. The proposed buffer zone requirement would necessitate the acquisition of more land. This additional cost could lower the profit margin to a degree that operating the reprocessing facility would be uneconomical. The alternative of locating further away from an urban area where land is less expensive will probably not be viable because of increased hauling costs.

Response

EPA agrees that requiring the same buffer zone width at all facilities would be inequitable. Hazards from leaks, spills, and explosions are dependent upon the types of wastes handled at a facility, the size of the facility (i.e., the number of tanks, landfills, etc.), and the types of operational units (i.e., tanks, containers, surface impoundments, etc.) at a facility.

EPA also agrees that some of the protection provided by surface water diversion or collection and containment requirements reduce the need for a buffer zone. Additional protection is provided at treatment and storage facilities in the facility standards by the set-back requirements for tanks and containers that hold ignitable and reactive waste.

One reason that EPA has not included a general buffer zone standard in the final rules is that the Agency believes that it is better to set such a requirement at the local level. Regional factors such as population density, land availability, and proximity of the facility to residences, schools, and hospitals can be factored into the distance required.

d. Alternate suggestions for the length of the buffer zone

(i) The requirement for a 200 foot buffer zone is excessive and should be reduced to (a maximum of) 100 feet because:

- 100 feet is sufficient in most cases, and this distance is consistent with state experience with safely operated facilities rather than on Oklahoma's regulation which is not backed by any experience.
- Many states only require a 50 to 100 foot buffer zone. For example, Pennsylvania has found that a 50 foot buffer zone amply serves environmental interests.

(ii) The standard should require a 50 foot buffer zone. If a larger buffer zone is required, it should be specified in the facility's permit.

(iii) The standard should require a 100 foot buffer zone with the caveat that EPA may require a greater distance in cases posing a particular hazard to neighboring properties.

(iv) The standard should require a 100 foot buffer zone in order to be consistent with existing set-back policies regarding floodplains, wetlands, and surface mining.

(v) The "note" to the standard should be deleted and the requirement for a 200 foot buffer zone should be replaced with a 100 foot buffer zone requirement. This revision will curtail the growth of facilities' property ownership, which is advantageous because sloppy operations may take place in unnecessarily large sites.

(vi) 200 feet is generally acceptable unless the site operator can show evidence that a lesser distance would adequately protect human health and the environment. The buffer zone should not exceed 200 feet.

(vii) The standard should require a distance of 300 feet between the active portion of a disposal facility and the facility's property line; this suggestion is based on data derived from the lateral subsurface migration of septic tank effluents.

(viii) If the other (proposed) regulations for disposal facilities are followed properly (thus, preventing escape of fugitive emissions in all three directions) and the monitoring equipment is installed in the proper location, the buffer zone could be substantially reduced, perhaps to 20 feet or less.

(iv) The buffer zone should have the same width as the average thickness of the bottom seal of a landfill, or alternatively; the buffer zone should have the same width as the distance from the top of the landfill to its bottom seal. The latter option is derived from a consideration of contruction parameters. Both of these options permit the concurrent or subsequent installation of a barrier which should substantially seal in potential fugitive emissions through ground migration.

Response

These comments illustrate the arbitrary nature of a general buffer zone requirement. A reasonable buffer zone distance can only be set for a defined set of circumstances (e.g., treatment or storage of reactive waste in a tank) or, on a case-by-case basis during the permitting process. At present, EPA believes that a general buffer zone requirement is unnecessary because of the protection that the facility standards provide to human health and the environment. If EPA becomes aware of a situation where a buffer zone or set-back distance is needed to adequately protect human health and the environment, EPA may, at that time, either specify a certain distance (as in the case of containers holding ignitable and reactive waste), or leave it up to the permitting official to set an appropriate buffer distance based on site-specific determinations.

e. The "NOTE" to the standard

(i) Detailed guidance should be given as to how the owner or operator can demonstrate that his facility can meet the provisions of the "note". There should be a delineation of the acceptable means of controlling unexpected releases and, what constitutes "sufficient" proof. Also, the design base release and other data should be described.

(ii) It is difficult, vague, potentially burdensome, expensive, and/or impossible to demonstrate compliance with the note.

(iii) The conditions of the note are redundant to the requirements for contingency plans and emergency procedures specified in Section 250.43-3.

(iv) An exemption from the 200-foot limit should be allowed if contingency plans or emergency procedures adequately handle probable and possible incidents.

Response

EPA agrees that compliance with the proposed "NOTE" would be difficult to demonstrate. EPA also agrees that the final Contingency plan and Emergency procedures (Subpart D) and Preparedness and Prevention (Subpart C) standards provide some of the protection to human health and the environment that the proposed buffer zone standard was meant to provide.

f. General comments

(i) This standard fails to make any distinction in the degree to which a waste is hazardous. It is excessive for relatively low hazard wastes (e.g., utility waste). Also, "moderately" hazardous waste should be exempt from the buffer zone requirement. This is particularly true of phosphate related waste (e.g., gypsum) where the standard would cripple phosphate operations.

(ii) A specific distance for a buffer zone should not be specified because:

- It is too arbitrary and inflexible to be universally applicable and therefore will be excessive in some cases and insufficient in others.
- This approach allows no consideration of site specific operating and design conditions.
- It will prevent construction and operation of facilities near industrialized areas and near manufacturing plants located in towns or cities where sizeable

pieces of land are hard to find.

- Distance from the boundary line is not relevant to the general safety or operating performance of a facility.

(iii) Suggested alternatives to specifying a buffer zone distance are:

- Requiring that "adequate buffer zone be maintained to allow for safety".
- That EPA require proof that a facility has adequate technologies and "emergency plans" to control accidental discharges or releases of hazardous waste.
- Requiring structural protection (e.g., a dike). This would be far more effective in protecting the public from an explosion.
- Requiring that a satisfactory facility design be demonstrated.

(iv) The need for and, if required, the size of a buffer zone should be determined on an individual site basis.

(v) Revise the standard to take into account; (1) the nature and type of hazardous waste, (2) surrounding land use, and (3) the function of the active portion of the facility.

(vi) Protection of neighbors against spills and explosions should not be considered within the regulatory sphere.

(vii) EPA has not demonstrated the relevance of the buffer zone to the matter of protection of human health and the environment.

(viii) The purpose(s) of the buffer zone should be directly stated in the standard. If it is not stated, buffer zone adequacy may not be addressed by facility operators. The following purposes were suggested by the commenters:

- Provides adequate space and time to detect and correct any ground or surface water contamination before such contamination reaches the adjoining property.
- Provides adequate distance to protect the health of area residents.
- Provides access for emergency equipment.

(ix) The standard does not provide for protection of the public from noise or airborne pollutants resulting from facility operations; particularly in the case of catastrophes (e.g., chemical fires, uncontrolled reactions, explosions).

(x) A 200 foot buffer zone does not adequately protect the safety of the general public; particularly if the facility manages ignitable, reactive, and/or incompatible waste.

(xi) The Agency should clarify that the term, "property line" refers to the perimeter property line and not to the right-of-way boundaries around and through the property.

(xii) The requirement is unclear because the boundary of the storage, treatment, or disposal facility may not be the same as the owner's or operator's property boundary.

(xiii) The standard significantly reduces the capacity and/or the size of the usable area of a site. It is particularly onerous for small facilities because the buffer zone will consume an inordinate percentage of facility acreage.

(xiv) The proposed standard is contrary to the rights of individuals to the use of their property.

(xv) Because a regulator finds it easier to deny a variance rather than grant one, many owners or operators may have to comply with the standard in its most stringent aspect even though it is impractical and unnecessay for them to do so. Furthermore, the use of present and potential sites which would require a variance will be discouraged.

(xvi) 200 feet is the minimum acceptable buffer distance because:

- It will provide working space to attempt to correct discharges and a time delay before a discharge would contaminate external property.

- It will prevent adjacent property from being contaminated before detection takes place and thus, costly remedial actions and law suits would be avoided.

Response

Many of these comments have been responded to in responses to buffer zone comments preceding these. However, EPA does want to respond to a few commenters who brought up different issues. First, protection of neighbors against spills and explosions at a hazardous waste facility is certainly within EPA's mandate under RCRA to protect human health. However, contrary to what another commenter suggested, EPA does not believe that protecting the public against noise is within RCRA's mandate. Noise is usually controlled by local ordinance. EPA's facility standards do not contain specific requirements for airborne pollutants during "catastrophes". Provisions are in place for the emergency coordinator at a facility to assess the danger to the surrounding public in the event of an emergency, so that evacuation can be initiated immediately if necessary. Other facility standards which protect the public from airborne pollutants are in the incineration, thermal treatment, and prohibition of open burning (except for restricted detonation or burning of explosives) regulations.

4. Rationale for deletion of the proposed standard

EPA has reevaluated the need for a buffer zone at hazardous waste facilities. This reevaluation was prompted by the numerous comments received on the proposed standard and a subsequent comparison of the protection afforded by the proposed buffer zone standard* and that provided by the Part 264 and Part 265 standards. EPA determined that a general buffer zone requirement would be redundant of the facility standards.

It is clear after reviewing the numerous comments submitted on the proposed buffer zone requirement that it is hard to specify a single buffer zone distance that is appropriate for, and feasible to institute at all hazardous waste facilities. As one commenter pointed out, a single buffer zone distance is too arbitrary and inflexible to be universally applicable and therefore, it would be excessive in some cases and insufficient in others.

Commenters suggested many factors that would influence the size of the buffer zone that is needed at a facility. These factors included the type and size of the facility, the volume and degree of hazard of waste(s) handled at the facility, type of land use surrounding the facility, and operating procedures practiced at the facility; particularly contingency plans and emergency procedures. It was also pointed out that a buffer zone standard would be impossible, or extremely burdensome to implement at existing facilities.

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* Although unknown in practice, the purposes of the proposed buffer zone standard cited in the rationale for the proposed standard provide insight into the protection that EPA believed a buffer zone could provide.

a. Ignitable, reactive, and incompatible wastes

One purpose of the proposed standard was to reduce risks to human health and the environment in the vicinity of the facility in the event of a fire, explosion, or spill. With respect to the first two; fires and explosions are usually associated with ignitable or reactive wastes or, the mixing of incompatible wastes. The presence of toxic or corrosive waste may increase the hazards associated with a fire or explosion, but these waste are usually not the source of such acute incidents.

The Agency has taken a different approach in the Phase I and Phase II rules to protecting human health and the environment from incidents such as fires and explosions which might occur during treatment, storage, or disposal of ignitable, reactive and incompatible waste. Instead of providing buffer zone protection through a location standard, the Agency has elected to tailor the protection to type of waste handled at a facility and the operating units present at a facility.

The regulations not only contain general requirements for ignitable, reactive, and incompatible waste (Subpart B, §265.17), but specific procedures for managing ignitable, reactive and incompatible waste are specified for piles (§§264.256 and .257), containers (§§264.176 and .177), tanks (§§264.198 and .199), surface impoundments (§§264.229 and .230), landfills (§265.312 and .313), and chemical, physical, biological (§§265.405 and .406) and land treatment (§§265.281 and .282) facilities.

Ignitable and Reactive Wastes

Standards which are most similar to the proposed buffer zone requirement are "set-back" distances for containers and tanks. Specifically, containers holding ignitable or reactive waste must be located at least 15 meters (50 feet) from the facility's property line. Covered tanks which are used to treat or store ignitable or reactive waste must be in compliance with the National Fire Protection Association's (NFPA's) buffer zone requirements for tanks, contained in Tables 2-1 through 2-6 of the "Flammable and Combustible Code - 1977."

The remaining final standards for ignitable and reactive waste are operational requirements designed to prevent emergency incidents such as fires and explosions.

Incompatible Wastes

The final standards concerning management of incompatible waste require that incompatible wastes must be separated during management. For example, storage containers holding hazardous waste that is incompatible with any waste or other materials stored nearby in other containers, piles, open tanks, or surface impoundments must be separated from the other materials or protected from them by means of a dike, berm, wall, or other device (§264(5).177(c)). Under Section 264(5).17(b), incompatible wastes and materials can only be mixed or commingled if this does not:

(1) Generate extreme heat or pressure, fire or explosion, or violent reaction;

(2) Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment;

(3) Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions;

(4) Damage the structural integrity of the device or facility; or

(5) Through other like means threaten human health or the environment.

In addition, the waste analysis (§264(5).13) standards are designed to ensure that owners and operators know the identity and nature of the wastes that they manage so that emergency incidents due to mistaken identity will be minimized.

b. Spills

The Agency believes that the final Subtitle C standards also adequately protect human health and the environment from spills of hazardous waste. The purpose of the proposed buffer zone standard with respect to spills was to provide a medium to bring the hazardous waste into control before it crossed the facility's property boundary and also to allow the waste to dilute before it crossed the facility's property boundary. The final rules contain standards for prevention of spills (e.g., maintaining sufficient freeboard in uncovered tanks (§264(5).192) and surface impoundments (§264(5).222)), containment of spills (e.g., containment systems for storage areas (§264.175)), and emergency procedures for cleaning up of spills (§264(5).56 - Emergency Procedures). The Preparedness and Prevention Standards specify that adequate aisle space must be maintained at a facility at all times to allow the unobstructed movement of spill control and other emergency equipment. The contingency plan and emergency procedures are required to be carried out immediately, and therefore the spill should be controlled or at least purposefully diluted or decontaminated before it crosses the facility's property line.

c. Dissipation and control of discharges

Another purpose of the proposed buffer zone standard was to allow discharges resulting from underground leaks to dissipate or be brought under control before crossing the facility's property line. Operating and design requirements for the different components (e.g., tanks, landfills) of facilities are designed, in part, to prevent underground leaks. Groundwater monitoring (Subpart F) is required for components of facilities that are likely to be a source of underground leaks (e.g., landfills and surface impoundments) unless adequate protection is otherwise provided. For those parts of facilities that are less likely to be a source of underground leaks, inspections are required (i.e., inspection of construction materials of tanks (§264(5).194)).

d. Odors and Noise

The last purpose of the proposed buffer zone standard was to conceal facilities and reduce odors and noise reaching the surrounding community. EPA believes that minimum set-backs for aesthetic purposes are best handled at the local level.

In summary, EPA believes that the Subtitle C regulations will provide the needed degree of protection to human health and the environment.

IV. RESPONSE TO COMMENTS ON RELATED ISSUES

A. General Comments

This section addresses those comments which were made with respect to the general site selection standards taken as a whole.

1. Existing facilities

C. The general site selection standards (especially the standards concerning active fault zones, regulatory floodways, coastal high hazard areas, 500-year floodplains, and wetlands) are overly stringent and will result in the closing of many well designed and constructed existing facilities. The performance (i.e., not causing environmental harm) of existing facility should be considered before deciding that the facility must be closed for noncompliance with a specific design standard. To force these facilities to close would create a serious shortage of acceptable hazardous waste disposal facilities. Furthermore, to apply site selection standards to such facilities would be contrary to Congressional intent to apply only those standards "as may be necessary to protect human health and the environment". If human health and the environment are already being protected, site selection standards are not necessary within the meaning of RCRA.

2. Geographical impact of the standards

C: The site selection standards will rule out construction and continued operation of facilities in many areas of the country except at prohibitive cost. This is particularly true for facilities that are or would be located in industrialized river valleys, the Gulf Coast, the Eastern States, and California. For example, coastal areas of states that border the Atlantic Ocean and the Gulf of Mexico are designated as within a 500-year floodplain, coastal high hazard area, and regulatory floodway.

This will create a serious shortage of acceptable sites for hazardous waste facilities in these areas, and it will pose a significant threat to public health due to the need to transport waste through populated and congested areas in order to reach facilities which can meet the siting requirements. In addition, transportation costs will increase waste management costs.

Response to issues #1 and #2

In the Location standards, the Agency has tried to lessen the impact on facilities while continuing to protect human health and the environment. Variance procedures, permit-conditional requirements, and a reasonable period of time for existing facilities to comply with the floodplain standard provide the flexibility that is necessary so that certain geographical areas and existing facilities are not inordinately penalized.

The Agency believes that the Location standards are necessary to protect human health and the environment. The subject areas of the Location standards were chosen because the Agency feels that location in these areas requires additional safeguards, or an absolute prohibition in the case of new facilities within 200 feet of a fault which has had displacement in Holocene time.

Furthermore, if existing facilities are designed and operated in what EPA considers an environmentally acceptable manner for the area that they are located in, there should not be any problem in complying with the floodplain standard.

EPA believes that increased flexibility in the Location standards should prevent the unnecessary closing of facilities and therefore should prevent any subsequent shortage of facilities and increased transportation of hazardous waste.

3. Applicability of site selection standards

C: The site selection standards should not be applied equally to all types of facilities. In particular, incinerators (or other facilities that destroy waste) should not be restricted in siting considerations because these facilities do not contain sufficient quantities of waste to cause substantial harm to human health or the environment. There is inequity in applying the same site selection criteria to treatment facilities and land disposal facilities. The general site selection standards should only include requirements that must be met by all treatment, storage, and disposal facilities.

R: The proposed rules contained a General Site Selection section (250.43-1) and additional siting requirements for landfills, surface impoundments, and landfarms. EPA has used the same approach in the Phase II rules.

The relationship between a land disposal facility and groundwater and soil types necessitates a more in depth consideration of those parameters when siting a land disposal facility. Therefore, the Phase II rules will specify additional location requirements for landfills, surface impoundments, and land treatment facilities if they are deemed necessary (i.e., if the facility standards are not adequately protective).

EPA believes that the Location standards should (§264.18) apply equally to all facility types. However, the floodplain standard is only applicable to facilities subject to regulation under Part 264, Subparts I, J, K, and L. EPA has limited the applicability of this standard primarily because of concern over the impact of the standard on land disposal facilities. As additional facility standards are promulgated in the future, the Agency will amend §264.10(b) when it is determined that the floodplain standard should apply to those new Subparts.

With respect to the comment on facilities which destroy waste: units which destroy waste usually do not exist in isolation; i.e., they are usually associated with storage facilities. Therefore substantial quantities of waste may be at the site. Another consideration here is the "quality" of the waste and not just the quantity. Incinerators frequently treat the most toxic hazardous wastes such as PCB's and dioxin; a relaxation of the Location standards would certainly not be appropriate if the facility handles acutely toxic hazardous waste.

4. Degree of hazard

C: The site selection criteria should not apply equally to facilities that manage marginally hazardous and very hazardous wastes. A relaxation of the site selection standards is in order for facilities that manage a large volume of low hazard waste or a small volume of high hazard waste because these facilities would pose substantially little risk to either human health or the environment, when located in the prohibited areas.

R: The Location standards (§264.18) are those which the Agency believes are appropriate for facilities which manage any hazardous waste as defined in Part 261. However, it is possible that a new class of wastes, termed acutely hazardous in Section 261.33, may demand more stringent requirements. EPA has to investigate if more stringent standards are necessary for facilities which handle these wastes and the implications of writing such standards.

EPA does not agree that a large volume of low hazard waste or a small volume of high hazard waste would necessarily pose little risk to either human health or the environment. For example, a large volume of slag could create a substantial risk to the environment and indirectly to human health if flood waters dispersed the slag into shallow waters or wetland areas. The slag could interfere with the biochemical processes of the biota, or a toxic component of the waste could bioaccumulate in the tissues of edible fish or shellfish.

The Agency has eliminated the impact on producers of low hazard waste which was a hazardous waste under the proposed rules because it exhibited the toxicity characteristic. In the Phase I, Part 261 rules the EP toxicity criterion was increased by a factor of 10.

5. Inconsistency of the concept of general site selection standards and specific operating and design standards

C: The threat which facilities pose to the environment and to the public does not lie solely or primarily with the location of facilities. It is the integrity of the design, construction, operation, and maintenance of the facility which determines if a facility will cause any damage to public health or the environment. Facilities should be allowed to be located anywhere provided that it can be demonstrated that they can be safely operated or that adequate safeguards can be provided. The concept of the general site selection standards is inconsistent with the concept of minimizing the danger of release of hazardous waste through specific operating and design standards.

R: EPA believes that the Location standards reinforce rather than contradict the protection to human health and the environment that is afforded by the operating and design standards. The Agency believes that the standards which protect the facility from the environment (e.g., 100-year floodplain) are necessary in order to minimize the possibility of uncontrolled release of hazardous waste because of additional hazards associated with locating in these areas. Although not included in these Location standards, other standards serve to protect the environment from the adverse impacts of the facility (e.g., locating in a wetland or critical habitat). Those standards provide necessary screening of facilities for potential impacts because fragile environments can be disturbed or destroyed simply by a facility locating there, and indirect impacts such as increased traffic volume compound the degradation.

EPA agrees that in some cases, the integrity of the design, construction, operation, and maintenance of the facility precludes the need for a location standard. The deletion of the proposed sole source aquifer general siting standard is a case in point where EPA felt that protection of human health and the environment was adequately provided by the facility standards. Thus, EPA deleted that location standard.

6. Inequity of regulations regarding hazardous waste and hazardous material management

C: Facilities which store, treat, or incinerate hazardous waste pose no greater threat to human health and the environment than manufacturing plants which generate or store hazardous materials on-site, and thus it is inequitable to regulate the location of the former and not the latter. Also, it is unreasonable not to allow on-site storage, treatment, or incineration of these hazardous materials once they become hazardous wastes.

R: RCRA takes effect once a material becomes a hazardous waste. Manufacturers who generate hazardous waste are subject to the law and its regulations. On-site facilities which store, treat, or incinerate hazardous wastes are also subject to the law and its regulations. To alter this pattern of coverage would require legislative changes.

7. State/local regulation of facility location

C: The standards should be less detailed in order to allow state/local authorities to develop regulations which are tailored to the characteristics of the individual state/locality.

R: Standards need to be as detailed as necessary to allow compliance. EPA considers the level of detail in the Location standards appropriate. States may not set requirements that are less stringent than the Federal EPA program; however, they may set stricter requirements to tailor the standards to their particular circumstances.

C: The standards should be more detailed in order to assist the States in determining the suitability of hydrologic, geologic, and soil parameters for the location of hazardous waste facilities.

R: EPA will provide assistance on determining the suitability of hydrologic, geologic, and soil parameters by making available guidance manuals to accompany the Location standards and the land disposal regulations.

C: In view of the political difficulties associated with establishing facilities in certain states, and the possibility of inadequate disposal capacity, if states fail to mandate means to allow facilities to locate within their boundaries, EPA should step in and require the states to do so.

R: RCRA does not give EPA the authority to step in and require States to mandate means to permit establishing facilities within their boundaries. "Section 3006(b) of RCRA provides that State programs can only be approved if they are 'equivalent to' and 'consistent with' the Federal program." (45 FR 33395, May 19, 1980) RCRA therefore "speaks only to the 'inconsistency' of

State program submissions, not of State laws generally". However, "...State programs which contain provisions that prohibit treatment, storage or disposal of hazardous waste within the State, will be deemed inconsistent if the prohibition has no basis in human health or environmental protection." (45 FR 33395) (See 45 FR 33395 for a further discussion of this issue.)

C: Where an owner or operator must demonstrate under the notes that his facility will not pose a threat to human health and the environment, state, as well as Federal, approval should be required in order to sanction the location of the facility. In addition, where two or more notes are involved, a public hearing should be required so that local input can also be taken into consideration.

R: All variance provisions that the permit applicant wants to comply with and demonstrations that the applicant wants to make will appear as conditions for issuance in the draft permit. Pursuant to the Part 122-124 regulations (45 FR 33290, May 19, 1980), issuance of a Federal permit does not relieve applicants from compliance with State requirements, therefore State approval is always required where the State has such authority, regardless of whether its program is approved. Where EPA has jurisdiction over the hazardous waste program, State and local input can be submitted during the public comment period or at the public hearing. Public hearings are held if there is a significant degree of public interest in the draft permit. See Part 124 (45 FR 33484, May 19, 1980) for more detail on the procedures for a public hearing and procedures for appealing a permit.

C: Site specific considerations are best handled at the State level (in contrast to the Federal or local level) because municipal politicians are subject to intense local pressure to disallow the location of facilities in their areas; i.e., municipal leaders may restrict the location of facilities in their localities based on political rather than environmental considerations.

R: State politicians can likewise be subject to political pressures. EPA has specified minimum Location standards and has left many areas open where a state can fill in additional Location standards for such concerns as odors, noise, and proximity to residences, hospitals, and schools.

8. Variances to the proposed coastal high hazard area, 500-year floodplain, wetlands, critical habitat, sole source aquifer, and buffer zone standards.

C: The Regional Adminstrator will be unable to give the necessary attention and in-depth study that each request for a variance demands.

R: The variance provisions have been minimized leaving a manageable burden on the Regional Administrator.

C: The "Notes" should be included as part of the regulations because:

- Even though they have the weight of law, if they were part of the rules, there would be no question as to the use of alternative engineering specifications for some facilities.
- The legal effect of a note to a regulation is uncertain.

R: EPA has deleted the use of notes in the final standards. Comments are provided for clarification.

C: The "Notes" to the proposed standards should be deleted because:

- There is no reason to accept the attendant risk of allowing facilities to locate in environmentally sensitive areas.
- The standards should be applied uniformally across the nation.
- Performance standards at the time a permit is issued cannot ensure future reliability.
- They are contrary to EPA's Congressional mandate and the intent of RCRA, which are to protect health and the environment.

R: It is common practice to incorporate variances into standards. In this case, variances were considered necessary because of the diversity of hazardous waste facility designs and the range of wastes that are potentially managed at a facility. Variances are alternate means of providing equal protection to human health and the environment. Sufficient flexibility has been incorporated into the location standards so that variances, except in the case of the floodplain standard, were not necessary.

EPA must also consider the impact of the standards and the ease with which the regulated community will be able to comply with such standards. For example, where a standard has the potential to close many existing facilities and an alternate procedure is available which will be equally protective of human health and the environment and yet will result in less of an impact to the regulated community, EPA believes that owners or operators should be allowed to demonstrate compliance through the alternate procedure.

Future reliability of a facility is ensured by the facility standards. Also the location of a facility will be considered when a RCRA permit is modified or revoked if new information or standards indicate that a threat to human health or the environment exists which was unknown at the time for permit issuance (§122.15(c)).

B. Miscellaneous Comments

C: If facilities are prohibited from the subject areas of the siting standards, forthcoming technological advancements to cope with siting in these areas will be stifled.

R: The Agency does not agree. Technological innovation could prompt the Agency to revise its regulations. EPA supports the development of technologies to cope with siting in environmentally sensitive areas.

C: Federal lands should be screened for potential use as disposal sites because the large quantities of waste that will be designated "hazardous" will need disposal sites.

R: EPA is exploring with other Federal agencies both the desireability and the possibility of siting hazardous waste treatment, storage, and disposal facilities on Federal lands. Results of this review will be incorporated, where appropriate, as amendments to the regulations.

C: There should be no blanket prohibition against the use of any area as a disposal site; evaluation of each site would be more appropriate.

R: EPA agrees with this commenter except in the case of facilities that propose to locate within 200 feet of a fault which has had displacement in Holocene time. The technology is not available to build a safe facility within that area.

An evaluation of each site is provided for in the permitting process. The permitting official will evaluate if the location of the facility is in compliance with all applicable regulations.

C: Due to the variable nature of the geology and climatology of the United States, the same site selection criteria cannot apply to every area of the States. For example, if waste acid/metal solutions which are hazardous due to their toxicity are released from a landfill in areas with basic soils, the acid would be neutralized and the metals immobilized by the cation exchange capacity of the soil.

R: EPA has tried to make the Location standards flexible enough so that they can be applied to every area of the States.

States with authorized hazardous waste programs under §3006 of RCRA can specify additional or more stringent siting criteria that are needed in their States.

C: The general siting requirements are not specific or stringent enough to assure that facilities will be sited in the best possible manner, and to adequately protect human health and the environment.

R: EPA believes that the Location standards are specific and stringent enough to assure that facilities will be sited so that human health and the environment will be protected in those areas that are the subject of the standards. EPA realizes however that the Location standards are not complete and EPA will continue to propose and finalize additional standards as the need arises.

C: The special considerations that need to be taken into account for the geography of Louisiana are only accounted for through the note mechanism.

R: It is difficult to answer this comment, as the commenter did not specify what he meant by "geography of Louisiana". However, EPA believes that adequate leeway has been provided in the Location standards.

C: Many ponds and lagoons that are part of NPDES permitted facilities will fail the site selection criteria.

R: Since NPDES permitted facilities are near surface water, the only Location standard that would directly impact NPDES facilities is the 100-year floodplain standard. These facilities will be accommodated through the use of compliance schedules in their permits. EPA does not believe that the Location standards (§264.18) will significantly burden NPDES ponds and lagoons.

C: The rules concerning protection of ground water should be strengthened.

R: Because land disposal facilities pose a greater threat to contaminating ground water than other facility types, more restrictive siting requirements may be specified in Subparts K, M and N, where they are deemed necessary, for protection of ground water.

C: The proposed siting standards go beyond normal engineering design considerations and limit future expansion capabilities.

R: The Location standards are largely performance standards, and as such do not require particular designs. Engineering designs do exist whereby the performance standards can be met. For example, the engineering technology exists to reinforce an incinerator so that it can stand up and remain intact under the forces of a 100-year flood. The guidance/permitting manual on the Location standards will provide information on engineering design considerations.

The Location standards do not limit future expansion capabilities (i.e., future expansion is not specifically regulated) where the expansion is in conformance with the Location standards. Commenters were particularly concerned that the proposed buffer zone standard would limit future expansion capabilities. Because this standard has been deleted EPA believes that this concern has been largely relieved.

C. Comments Requesting Additional Location Standards

Comments were received which recommended consideration of additional Location standards. These are summarized and responded to below.

C: Farmland - because the treatment, storage, and disposal of hazardous waste near farms has frequently endangered the quality of the farms' livestock and produce.

R: Although contamination of farmland may have occurred in the past from environmentally unsound treatment, storage, or disposal of hazardous waste, the Part 264 and 265 operating and design requirements (in particular, the standards concerning spill confinement, diversion of run-on and collection of run-off, ground-water monitoring, and inspections) are designed, among other things, to minimize the potential for contaminating adjacent land by direct and indirect means.

C: Surface water (rivers, lakes, oceans, and reservoirs) - because much of the damage attributable to hazardous waste has occurred in these areas, and has resulted in the contamination of drinking water and fisheries.

R: The Section 3004 facility standards will minimize indirect contamination of surface water. The standards controlling run-on and run-off, spills, leachate, and ground water monitoring will be most effective in this regard. Surface waters are additionally protected by the floodplain siting restriction.

Hazardous waste facilities will have to obtain permits pursuant to Sections 402 and 404 of the Clean Water Act if the facility discharges pollutants or dredged or fill material to surface waters. Wild and scenic rivers are also protected by Federal law. (The guidance/permitting manual on the Location standards has a section on compliance with the Wild and Scenic Rivers Act.)

Because of these protection mechanisms already in place, EPA does not believe that an additional siting standard is needed for surface waters.

C: Cultural resources - because Section 106 of the National Historic Preservation Act of 1966, as amended, directs all Federal agencies having direct or indirect jurisdiction over proposed Federal or Federally-assisted undertakings to assess the effect of such undertakings on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. In addition, Federal agencies must give the Advisory Council on Historic Preservation an opportunity to comment on any such undertaking in accordance with the Council's Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800).

- because Executive Order 11593 requires Federal agencies to consider, in consultation with the Advisory Council, the effect of their programs and plans on both federally-owned and nonfederally-owned sites, structures, and objects of historical, architectural or archeological significance.

R: Part 122 - EPA administered permit programs - requires (§122.12(b)) that the Regional Administrator adopt measures when feasible to mitigate potential adverse effects of the permitted activity on properties listed or eligible for listing in the National Register of Historic Places. That Section further states that: "The Act's requirements are to be implemented in cooperation with State Historic Preservation Officers and upon notice to, and when appropriate, in consultation with the Advisory Council on Historic Preservation." (see 45 FR 33428, May 19, 1980)

Thus, EPA will consider effects on historical, architectural or archaeological sites before making a final decision on a permit application. The guidance/permitting manual on the Location standards contains a section on compliance with the National Historic Preservation Act.

C: Recreation resources - because the generator or permit applicant should be made aware of Section 6(f) of the Land and Water Conservation Fund Act of 1965, as amended, and the provisions of the Surplus Property Act. Both of these Acts may impact the permitting of hazardous waste facilities in certain locations.

R: Land acquired pursuant to the Land and Water Conservation Fund Act and the Surplus Property Act will probably not be available for use as the site of a hazardous waste facility because of the purpose for which those areas are set aside. In any case, EPA cannot list every law that a permit applicant might be affected by.

C: Federal land - facility owners or operators should be made aware that facilities will not be allowed to locate on public land unless the Federal agency having administrative responsibility for that land approves the installation of the facility, and the owner or operator complies with all constraints imposed on it by the responsible Federal agency.

R: Although what this commenter suggested seems like a reasonable approach, EPA has not as yet formulated a policy with respect to locating hazardous waste facilities on Federal lands. EPA will call upon other Federal Agencies including the Departments of Agriculture, Interior, Defense, the Council on Environmental Quality (CEQ), and the Office of Management and Budget (OMB) to be directly involved in developing the policy.

D. Permafrost Areas

1. Proposed approach to permafrost areas

In the preamble to the proposed rules (43 FR 58985, December 18, 1978), EPA recognized that permafrost areas are fragile ecosystems with a significant potential for erosion and groundwater contamination. As such, the Agency believes that these areas should be protected from the uncontrolled siting of hazardous waste facilities. However, because the only State where permafrost areas are found is Alaska, the Agency also believes that it is more appropriate for the State of Alaska to determine what measures are needed to protect these areas.

2. Response to comments

C: Permafrost areas should be classified as extremely sensitive (the commenter did not provide a rationale for his viewpoint).

R: EPA agrees with the commenter in concept. As was stated in the preamble to the proposed rules, EPA believes that permafrost areas are "very fragile ecosystems."

C: EPA's approach to permafrost areas is satisfactory, however, it is questionable whether relaxation in such fragile terrain is compatible with RCRA, and whether it sets an undesirable precedent - that is, will other states be able to regulate siting in environmentally sensitive areas in their state.

R: EPA does not intend to take a relaxed attitude toward permafrost areas in Alaska. EPA will continue to study this problem until a standard can be proposed. If a State considers an environmentally sensitive area in their state to be an important consideration in siting facilities, and EPA has not promulgated a standard that addresses these areas, EPA believes that states should promulgate such standards in keeping with the spirit of RCRA's mandate.

C: The same logic used to allow Alaska to regulate permafrost areas should also apply to States which have specific agencies set up to regulate certain industrial activities such as oil and gas exploration.

R: EPA does not agree with the commenter. Allowing States to regulate hazardous wastes from certain industrial activities does not follow logically from allowing Alaska to regulate siting of facilities in permafrost areas (if that were the case). Permitting States to regulate hazardous waste from certain industrial activities would result in a waste being regulated differently depending on which state the waste was managed in. A potential result would be lenient regulation in States that want to attract industry. If EPA was to allow States to regulate wastes from certain industries, EPA would have to set minimum standards. This is in effect what will happen if EPA can fulfill its long term goal of writing industry specific standards in Part 266 because a State can be authorized to carry out the Subtitle C regulatory program under RCRA if a States' program is equivalent to the Federal program.

3. Deferral of final action

EPA received little comment on whom should write a standard for locating in permafrost areas, EPA or the State of Alaska. After consulting with the Alaska Department of Environmental Conservation, it is apparent that there are no standards which regulate siting of hazardous waste facilities in permafrost areas in Alaska. According to State officials, the Alaska Department of Environmental Conservation is awaiting the completion of studies on permafrost being conducted by the University of Alaska at Fairbanks before considering how such a standard should be written.

EPA recognizes permafrost as an important site condition which warrants a standard. However, we do not have sufficient background information at present to justify a standard. We are continuing to study this problem and will come out with a standard at a later time. Should Alaska promulgate an adequate standard as part of its State program, EPA would probably not promulgate a standard.

There are many unfavorable conditions associated with permafrost areas which suggest that the location of hazardous waste facilities in these areas should be controlled. Heat generated by operational units at a facility may cause the permafrost to warm to 32°F and thus melt. This heated area does not provide an acceptable degree of ground support for structures located on it; it can cause settling of the structures (operational units at a facility) and structural damage.

Permafrost itself is not stable and is known to cause ground movement with the consequence of damaging structures. The frozen ground will push-up, blistering the surface of the land with jagged pieces of frozen soil.

A related problem has to do with thawing of the surface or "active" layer of permafrost during the short summer season. The ground surface thaws to a depth of several inches, leaving the ground very wet. "Summer travel on this thawed surface can disrupt the fragile tundra vegetation. This, in turn, can lead to severe erosion."[93] Thus, hazardous waste management activities may have to be restricted to certain times of the year.

V. REGULATORY LANGUAGE

§264.18 Location standards

(a) Seismic considerations

(1) Portions of new facilities where treatment, storage, or disposal of hazardous waste will be conducted must not be located within 61 meters (200 feet) of a fault which has had displacement in Holocene time.

(2) As used in paragraph (a)(1) of this Section:

(i) "Fault" means a fracture along which rocks on one side have been displaced with respect to those on the other side.

(ii) "Displacement" means the relative movement of any two sides of a fault measured in any direction.

(iii) "Holocene" means the most recent epoch of the Quarternary period, extending from the end of the Pleistocene to the present.

[Comment: Procedures for demonstrating compliance with this standard in Part B of the permit application are specified in §122.25(a)(11). Facilities which are located in political jurisdictions other than those listed in Appendix VI of this Part, are assumed to be in compliance with this requirement.]

(b) Floodplains

(1) A facility located in a 100-year floodplain must be designed, constructed, operated and maintained to prevent washout of any hazardous waste by a 100-year flood unless the owner or operator can demonstrate to the Regional Administrator that procedures are in effect which will cause the waste to be removed safely, before flood waters can reach the facility, to a location where the wastes will not be vulnerable to floodwaters.

[Comment: The location where wastes are moved must be a facility which is either permitted by EPA under Part 122 of this Chapter, authorized to manage hazardous waste by a State with a hazardous waste management program authorized under Part 123 of this Chapter, or in interim status under Parts 122 and 265 of this Chapter.]

(2) As used in paragraph (b)(1) of this Section:

(i) "100-year floodplain" means any land area which is subject to a one percent or greater chance of flooding in any given year from any source.

(ii) "Washout" means the movement of hazardous waste from the active portion of a facility as a result of flooding.

(iii) "100-year flood' means a flood that has a one percent chance of being equalled or exceeded in any given year.

[Comment: (1) Requirements pertaining to other Federal laws which affect the location and permitting of facilities are found in §122.12 of this Chapter. For details relative to these laws, see EPA's manual for SEA (special environmental area) requirements for hazardous waste facility permits. Though EPA is responsible for complying with these requirements, applicants are advised to consider them in planning the location of a facility to help prevent subsequent project delays.]

Part 264, Appendix VI

Political Jurisdictions* in which Compliance with §264.18 (a) Must be Demonstrated

ALABAMA
- none

ALASKA
- Aleutian Islands
- Anchorage
- Bethel
- Bristol Bay
- Cordova-Valdez
- Fairbanks-Fort Yukon
- Juneau
- Kenai-Cook Inlet
- Ketchikan-Prince of Wales
- Kodiak
- Lynn Canal-Icy Straits
- Palmer-Wasilla-Talkeena
- Seward
- Sitka
- Wade Hampton
- Wrangell Petersburg
- Yukon-Kuskokwim

ARIZONA
- Cochise
- Graham
- Greenlee
- Yuma

ARKANSAS
- Arkansas
- Clay
- Cleburne
- Craighead
- Crittenden
- Cross
- Fulton
- Greene
- Independence
- Izard
- Jackson
- Lawrence

ARKANSAS (continued)
- Lee
- Lonoke
- Mississippi
- Monroe
- Phillips
- Poinsett
- Polk
- Prairie
- Randolf
- Sharp
- St. Francis
- Stone
- White
- Woodruff

CALIFORNIA
- all

COLORADO
- Archuleta
- Conejos
- Hinsdale
- Mineral
- Rio Grande
- Saguache

CONNECTICUT
- all

DELAWARE
- none

FLORIDA
- none

GEORGIA
- Banks
- Barrow
- Bartow

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* These include counties, city-county consolidations, independent cities, and, in the case of Alaska, election districts.

GEORGIA (continued)
Bryan
Bulloch
Burke
Candler
Catoosa
Chatham
Chattooga
Cherokee
Clarke
Cobb
Columbia
Dade
Dawson
De Kalb
Effingham
Elbert
Emanuel
Fannin
Floyd
Forsyth
Franklin
Fulton
Glascock
Gilmer
Gordon
Greene
Gwinnett
Habersham
Hall
Hancock
Hart
Jackson
Jasper
Jefferson
Jenkins
Johnson
Lincoln
Lumpkin
Madison
McDuffie
Morgan
Murray
Newton
Oconee
Oglethorpe
Pickens
Putnam
Rabun
Richmond
Rockdale
Screven
Stephens

GEORGIA (continued)
Talaferro
Towns
Treutlen
Union
Walker
Walton
Warren
Washington
White
Whitfield
Wilkes

HAWAII
Hawaii
Honolulu
Maui

IDAHO
Bannock
Bear Lake
Bingham
Bonneville
Caribou
Cassia
Clark
Franklin
Fremont
Jefferson
Madison
Oneida
Power
Teton

ILLINOIS
Alexander
Bond
Christian
Clark
Clay
Clinton
Coles
Crawford
Cumberland
Douglas
Edgar
Edwards
Effingham
Fayette
Franklin
Gallatin
Hamilton

ILLINOIS (continued)
- Hardin
- Jackson
- Jasper
- Jefferson
- Jersey
- Johnson
- Lawrence
- Macoupin
- Madison
- Marion
- Massac
- Monroe
- Montgomery
- Moultrie
- Perry
- Pope
- Pulaski
- Randolf
- Richland
- Saline
- Shelby
- St. Clair
- Union
- Wabash
- Washington
- Wayne
- White
- Williamson

INDIANA
- Gibson
- Knox
- Posey
- Sullivan
- Vanderburgh

IOWA
- Fremont
- Mills
- Page

KANSAS
- Anderson
- Atchison
- Brown
- Coffey
- Doniphan
- Douglas
- Franklin
- Geary
- Jackson
- Jefferson
- Johnson

KANSAS (continued)
- Leavenworth
- Linn
- Lyon
- Marshall
- Miami
- Morris
- Nemaha
- Osage
- Pottawatomie
- Riley
- Shawnee
- Wabaunsee
- Washington
- Wyandotte

KENTUCKY
- Ballard
- Bell
- Caldwell
- Calloway
- Carlisle
- Crittenden
- Fulton
- Graves
- Harlan
- Henderson
- Hickman
- Letcher
- Livingston
- Lyon
- Marshall
- McCracken
- Trigg
- Union
- Webster

LOUISIANA
- none

MAINE
- all

MARYLAND
- none

MASSACHUSETTS
- all

MICHIGAN
- none

MINNESOTA
- none

MISSISSIPPI
none

MISSOURI
Bollinger
Butler
Cape Girardeau
Carter
Crawford
Dent
Dunklin
Franklin
Howell
Iron
Jefferson
Madison
Mississippi
New Madrid
Oregon
Pemiscot
Perry
Reynolds
Ripley
Scott
Shannon
St. Charles
Ste. Genevieve
St. Francois
St. Louis
St. Louis City
Stoddard
Texas
Washington
Wayne

MONTANA
Beaverhead
Broadwater
Cascade
Deer Lodge
Flathead
Gallatin
Granite
Jefferson
Lake
Lewis and Clark
Madison
Meagher
Missoula
Park
Powell
Sanders
Silver Bow

MONTANA (continued)
Stillwater
Sweet Grass
Teton
Wheatland

NEBRASKA
Cass
Gage
Jefferson
Johnson
Lancaster
Sarpy
Otoe
Nemaha
Pawnee
Richardson

NEVADA
all

NEW HAMPSHIRE
all

NEW JERSEY
Bergen
Essex
Hudson
Hunterdon
Mercer
Middlesex
Monmouth
Morris
Passaic
Somerset
Sussex
Union
Warren

NEW MEXICO
Bernalillo
Catron
Grant
Hidalgo
Los Alamos
Rio Arriba
Sandoval
Santa Fe
Sierra
Socorro
Taos
Torrance
Valencia

NEW YORK
  Albany
  Bronx
  Clinton
  Columbia
  Delaware
  Dutchess
  Erie
  Essex
  Franklin
  Fulton
  Genesee
  Greene
  Hamilton
  Herkimer
  Jefferson
  Kings
  Lewis
  Montgomery
  Nassau
  New York
  Niagara
  Oneida
  Orange
  Orleans
  Otsego
  Putnam
  Queens
  Rensselaer
  Richland
  Richmond
  Rockland
  Saratoga
  Schenectady
  Schoharie
  St. Lawrence
  Suffolk
  Sullivan
  Ulster
  Warren
  Washington
  Westchester
  Wyoming

NORTH CAROLINA
  Alexander
  Alleghany
  Anson
  Ashe
  Avery
  Buncombe
  Burke

NORTH CAROLINA (continued)
  Cabarrus
  Caldwell
  Catawba
  Cherokee
  Clay
  Cleveland
  Gaston
  Graham
  Haywood
  Henderson
  Iredell
  Jackson
  Lincoln
  Macon
  Madison
  McDowell
  Mecklenburg
  Mitchell
  Polk
  Richmond
  Rowan
  Rutherford
  Stanly
  Surry
  Swain
  Transylvania
  Union
  Watauga
  Wilkes
  Yancey

NORTH DAKOTA
  none

OHIO
  none

OKLAHOMA
  Atoka
  Bryan
  Carter
  Choctaw
  Cleveland
  Coal
  Creek
  Garvin
  Grady
  Haskell
  Hughes
  Johnston
  Latimer

- OKLAHOMA (continued)
  - Le Plore
  - Lincoln
  - Marshall
  - McClain
  - McCurtain
  - McIntosh
  - Murray
  - Muskogee
  - Okfuskee
  - Oklahoma
  - Okmulgee
  - Pittsburg
  - Pontotoc
  - Pottawatomie
  - Pushmataha
  - Seminole
  - Stephens
  - Tulsa

- OREGON
  - none

- PENNSYLVANIA
  - Berks
  - Bucks
  - Carbon
  - Chester
  - Lackawanna
  - Lancaster
  - Lebanon
  - Lehigh
  - Luzerne
  - Monroe
  - Montgomery
  - Northampton
  - Pike
  - Schuylkill
  - Susquehanna
  - Wayne
  - Wyoming

- RHODE ISLAND
  - all

- SOUTH CAROLINA
  - all

- SOUTH DAKOTA
  - none

- TENNESSEE
  - Anderson

- TENNESSEE (continued)
  - Bledsoe
  - Blount
  - Bradley
  - Campbell
  - Carroll
  - Carter
  - Claiborne
  - Cocke
  - Crockett
  - Cumberland
  - Dyer
  - Fayette
  - Gibson
  - Grainger
  - Greene
  - Hamblen
  - Hamilton
  - Hancock
  - Hardeman
  - Hawkins
  - Haywood
  - Henry
  - Jefferson
  - Johnson
  - Knox
  - Lake
  - Lauderdale
  - Loudon
  - Madison
  - McMinn
  - Meigs
  - Monroe
  - Morgan
  - Obion
  - Polk
  - Rhea
  - Roane
  - Scott
  - Sequatchie
  - Sevier
  - Shelby
  - Sullivan
  - Tipton
  - Unicoi
  - Union
  - Washington
  - Weakley

- TEXAS
  - none

- UTAH
  - Beaver
  - Box Elder
  - Cache
  - Carbon
  - Davis
  - Duchesne
  - Emery
  - Garfield
  - Iran
  - Juab
  - Millard
  - Morgan
  - Piute
  - Rich
  - Salt Lake
  - Sanpete
  - Sevier
  - Summit
  - Tooele
  - Utah
  - Wasatch
  - Washington
  - Wayne
  - Weber

- VERMONT
  - all

- VIRGINIA
  - Bland
  - Buchanan
  - Carroll
  - Craig
  - Dickenson
  - Floyd
  - Giles
  - Grayson
  - Lee
  - Montgomery
  - Pulaski
  - Roanoke
  - Russell
  - Scott
  - Smyth
  - Tazewell
  - Washington
  - Wise
  - Wythe

- WASHINGTON
  - Chelan
  - Clallam
  - Clark
  - Cowlitz
  - Douglas
  - Ferry
  - Grant
  - Gray Harbor
  - Jefferson
  - King
  - Kitsap
  - Kittitas
  - Lewis
  - Mason
  - Okanogan
  - Pacific
  - Pierce
  - San Juan Islands
  - Skagit
  - Skamania
  - Snohomish
  - Thurston
  - Wahkiakum
  - Whatcom
  - Yakima

- WEST VIRGINIA
  - Mercer
  - McDowell
  - Monroe
  - Summers

- WISCONSIN
  - none

- WYOMING
  - Fremont
  - Lincoln
  - Park
  - Sublette
  - Teton
  - Uinta
  - Yellowstone National Park

TERRITORIES OF THE UNITED STATES:

American Samoa
  all

Commonwealth of the Northern Mariana Islands
  all

Guam
  all

Puerto Rico
  all

U.S. Virgin Islands
  all

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